Fall 2014

An exploratory factor analysis and reliability analysis of the student online learning readiness (SOLR) instrument

Taeho Yu
Purdue University

Graduate School Form 30
(Revised 08/14)

PURDUE UNIVERSITY
GRADUATE SCHOOL
Thesis/Dissertation Acceptance

This is to certify that the thesis/dissertation prepared

By Taeho Yu

Entitled
AN EXPLORATORY FACTOR ANALYSIS AND RELIABILITY ANALYSIS OF THE STUDENT ONLINE LEARNING READINESS (SOLR) INSTRUMENT

For the degree of Doctor of Philosophy

Is approved by the final examining committee:

Jennifer C. Richardson

Catherine E. Watt

Timothy J. Newby

Karen Swan

Chantal Levesque-Bristol

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_____

Approved by: Phillip VanFossen 12/08/2014

Head of the Department Graduate Program Date

AN EXPLORATORY FACTOR ANALYSIS AND RELIABILITY ANALYSIS OF THE STUDENT ONLINE LEARNING READINESS (SOLR) INSTRUMENT

A Dissertation

Submitted to the Faculty

of

Purdue University

by

Taeho Yu

In Partial Fulfillment of the

Requirements for the Degree

of

Doctor of Philosophy

December 2014

Purdue University

West Lafayette, Indiana

This is dedicated to my wife Yunjoung, my two sons Brian & Darren, and to my parents, for their great sacrifices, unconditional love, strong support, and consistent faith in me.

ACKNOWLEDGEMENTS

I would like to acknowledge and express my appreciation to Dr. Jennifer C. Richardson, my dissertation committee chair and my best mentor in the world, for advising and guiding me with great generosity, kindness, patience, understanding, and thoughtful consideration. She has contributed her tremendous time and efforts to help me to better develop my dissertation with her support. Dr. Richardson has been my role model as a mentor, an advisor, and a scholar. I have always tried to follow her path and will keep it continuously. In addition, I sincerely grateful to the other members of my committees: Dr. Timothy Newby, Dr. Karen Swan, Dr. Chantal Levesque-Bristol, and Dr. Catherine E. Watt.

TABLE OF CONTENTS

Page

Page

LIST OF TABLES

Table Page

LIST OF FIGURES

ABSTRACT

Yu, Taeho. Ph.D., Purdue University, December 2014. An Exploratory Factor Analysis and Reliability Analysis of the Student Online Learning Readiness (SOLR) Instrument. Major Professor: Jennifer C. Richardson.

The purpose of this study was to develop an effective instrument to measure student readiness in online learning with reliable predictors of online learning success factors such as learning outcomes and learner satisfaction. The validity and reliability of the Student Online Learning Readiness (SOLR) instrument were tested using Exploratory Factor Analysis (EFA) and reliability analysis. Twenty items from three competencies, i.e. social competencies, communication competencies, and technical competencies, were designated for the initial instrument based on the Student Online Learning Readiness (SOLR) Model as a new conceptual model. An exploratory factor analysis (EFA) revealed that four factor-structures of the instrument of student readiness in online learning explained 66.69% of the variance in the pattern of relationships among the items. All four factors had high reliabilities (all at or above Cronbach's $\alpha > .823$). Twenty items remained in the final questionnaire after deleting one item which cross-loaded on multiple factors (social competencies with classmates: five items, social competencies with instructor: five items, communication competencies: four items, and technical competencies: six items). The four-factor structure of the Student Online Learning Readiness (SOLR) has been confirmed through this study. Educators can use the Student

Online Learning Readiness (SOLR) instrument in order to discover a better understanding of the level of freshmen college students' online learning readiness by measuring their social, communication, and technical competencies. In addition, this study was looking at two factors of social integration in Tinto's SIM and has introduced the Student Online Learning Readiness (SOLR) conceptual model with the purpose to extend Tinto's social integration to online learning environment.

CHAPTER 1. INTRODUCTION

1.1 Introduction

Online learning is becoming an increasingly large part of higher education (Anderson, 2014; Duck & Parente, 2014; Kim, 2011). Over 7.1 million college and university students took at least one online course by the end of the fall 2012 semester in the United States (Allen & Seaman, 2014). More than 71% of US colleges and universities offered online courses in 2012 (Allen & Seaman, 2013) and one-third of higher education students took at least one online course in 2012 (Allen & Seaman, 2014). According to the U.S. Department of Education Distance Learning Report (Bakia, Shear, Toyama, & Lasserter, 2012), the benefits of online learning are: a) to broaden access to the educational resources, b) to personalize learning, c) to provide flexibility in time and location for students, and d) to reduce school-based facilities' costs. However, the benefits of online learning also bring some challenges into the field of education.

First, the retention rates in online learning courses are 10-25% less than those for traditional face-to-face classes (Ali & Leeds, 2009; Angelina, Williams, & Natvig, 2007; Holder, 2007; Lee & Choi, 2011; Poelhuber, Chomienne, & Karsenti, 2008) in higher education. In other words, over one half of distance students may dropout of their education as a result of online courses (Carr, 2000; Jun, 2005). Second, students who take online courses for the first time tend to feel lonely and socially isolated not only because

they are new to the online learning environment but also because they are not familiar with online learning communities (Cho, Shen, & Laffey, 2010; McInnerney & Roberts, 2004). This feeling of social isolation has a significant relationship with distance student attrition (Ali & Leeds, 2009; Link & Scholtz, 2000; Reio & Crim, 2006). Third, online learning requires learners to assume a greater responsibility for their studies and requires that they have additional skills or competencies (Zawacki-Richter, 2004). For these reasons, it is important to offer distance learners support to help these individuals be successful in their online learning (Watulak, 2012; Zawacki-Richter, 2004). In this manner, it becomes possible to improve student retention rates in online learning in higher education (Ali & Leeds, 2009; Atchley, Wingenbach, & Akers, 2012; Ludwig-Hardman & Dunlap, 2003; Moore & Kearsley, 2005).

Moreover, distance learners are more likely to have a lower sense of belonging than face-to-face students (Ma & Yuen, 2010). According to Goodenow (1993), the concept of a "sense of belonging" at school refers to "the extent to which students feel personally accepted, respected, included, and supported by others in the school social environment" (p. 80), and the positive relationships among a sense of belonging, students' motivation, and academic achievement were verifed by a series of previous research (Battistich, Solomon, Watson, & Schaps, 1997; Flook, Repetti, & Ullman, 2005; Furrer & Skinner, 2003; Osterman, 2000; Tinto, 1975; Tinto, 1988; Tinto, 1993; Tinto, 1997; Tinto, 1998). In line with the significance of a sense of belonging in an academic field, Tinto (1998) emphasized the positive effect of student-faculty interactions and student-student interactions on students' sense of belonging. In addition, technological elements, such as computer skills or Internet connections, are important success factors for online

learning, including learning outcomes and learner satisfaction (Ben-Jacob, 2011; Herrera & Mendoza, 2011; Watulak, 2012). For this reason, it is necessary to provide support for distance learners to enhance their social competencies with instructors and classmates as well as their communication competencies and technical competencies so that they can have a better learning experience.

One preemptive way to accomplish this is by assisting students to more accurately gauge their readiness for online learning before they start a program. Some universities require their students to take an online learning readiness test before they take online courses in an effort to provide input about those specific skills or areas where the student may have general deficiencies for online learning. However, existing online learning readiness surveys may only be focused on a narrow range of aspects – such as access to technology, basic computer skills, Internet connections or basic learner characteristics rather than upon a more all-encompassing profile which could be studied to address the competencies necessary for one to be truly successful (Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski, 2011).

1.2 Background

With respect to learner competencies, the terms "competency" and "competence" have been used as substitutes for one another in many studies. However, these two terms are slightly different from each other. The International Board of Standards for Training, Performance and Instruction (IBSTPI) defined competency as "a knowledge, skill, or attitude that enables one to effectively perform the activities of a given occupation or function the standards expected in employment" (Spector, 2001, p. 180). On the other

hand, according to Kerka (1998), "competence is individualized, emphasizes outcomes (what individuals know and can do), and allows flexible pathways for achieving the outcomes – making as clear as possible what is to be achieved and the standards for measuring achievement" (p. 2). With the understanding of these terms, as so defined, the word "competency" will be used for the purpose of this study.

Competencies are an individual's perception of his or her ability or capability. For this study social competencies are defined as skills, competencies, and the feeling of control essential for managing social situations and building and maintaining relationships (Myllylä & Torp, 2010). Communication competencies are defined as "the ability to demonstrate knowledge of the socially appropriate communicative behavior in a given situation" (p. 24). Technical competencies are defined as "self-efficacy in technology" (Heo, 2011, p. 61).

The effect of learners' competencies on their academic achievement has been studied in the field of online education. First, the importance of social competencies for distance learners' academic achievement has been supported (Chen et al., 2010; Parker et al., 2006; Williams, 2003). Cho and Jonassen (2009) found that there is a significant correlation between success in online learning environments and the student's social competencies in interacting with his or her instructor and peers in online courses. Second, a sizeable number of studies have proposed that interpersonal and communication competencies are the most influential predictors of academic achievement (Betermieux & Heuel, 2009; Dabbagh, 2007; Dabbagh & Bannan-Ritland, 2005; Volery & Lord, 2000; Williams, 2003). Third, technical competencies are considered to be a necessary component for successful learning experiences in online education (Osika & Sharp, 2002;

Selim, 2007; Watulak, 2012; Whale, 2006). Moreover, in terms of the influence of technical competencies on online education, Herrera and Mendoza (2011) proposed that technical competencies are a significant predictor for learning outcomes in online learning, which has been confirmed by Cho (2012), Ben-Jacob (2011), and Selim (2007).

However, although several studies have introduced various measures for technical competencies (Osika & Sharp, 2002; Saud et al., 2010; Selim, 2007; Soong et al., 2001; Wozney, Venkatesh, & Abrami, 2006), it is necessary to update these measuremes to more adequately and appropriately qualify and quantify the current online learning environment. For instance, Osika and Sharp (2002) and Saud et al. (2010) proposed measuring technical competencies that would be considered outdated at this time, such as formatting a disk, copying a file from one disk drive to another, sending and receiving e-mail, and properly starting and shutting down a personal computer.

1.3 Purpose of the Study

Distance learners should be provided with an opportunity to develop their competencies or readiness skills to better avoid a problematic situation involving non-content related learning challenges that could prevent them from succeeding in online learning. For this reason, it is essential to both measure and enhance the learners' readiness for online learning before they take an online course. However, many educators in higher education do not know how to measure their learners' social, communication, and technical competencies which are required for these learners to succeed in such environments (Yu, 2014). Moreover, although a number of universities develop and implement their own online learning readiness surveys, these surveys, as discussed

previously, tend to focus more on computer or Internet skills, technology accessiblity, and general learner characteristics such as attitute toward online education or personal learning preferences (Bernard, Brauer, Abrami, & Surkes, 2004; Kerr, Rynearson, & Kerr, 2006; Watkins, Leigh, & Triner, 2004).

For these reasons, the purpose of this study is to develop a more specified instrument designed to measure student readiness in online learning through a focus on social, communication, and technical competencies. The development of a new instrument to measure distance learners' online learning readiness is significant for the future of the field of online learning to provide useful and practical suggestions for administrators and educators in higher education as well as for the distance learners themselves. First, by using the existing literature related to a student's online learning readiness scales as a guide, a new instrument will be developed to measure the social, communication, and technical competencies of the varied learners within online learning environments. Second, the reliability and validity evidence of the developed instrument employed to measure social, communication, and technical competencies will be evaluated. The specific research questions addressed in this study are:

1. Which set of items should appropriately be included in the final instruments based on analyses of psychometric properties of the developed instrument that measures social competencies, communication competencies, and technical competencies?
2. What is the reliability and validity evidence of the developed instrument to measure social competencies, communication competencies, and technical competencies?

1.4 Significance of the Study

Previous research has supported the importance of measuring student readiness in online learning before students then proceed to take an online course (McVay, 2000, 2001; Parnell & Carraher, 2002; Smith, 2005; Watkins, Leigh, & Triner, 2004), as well as the significant effect of student readiness on students' academic achievement within the online learning environments (Bernard et al., 2004; Kerr et al., 2006). In addition, it is necessary to provide an adequate social and academic support in order to enhance the students' sense of belonging in online learning both for increased meaningful learning experiences and higher retention rates (Ali & Leeds, 2009; Atchley, Wingenbach, & Akers, 2012; Ludwig-Hardman & Dunlap, 2003). However, those existing student readiness instruments tend to ask about learner's computer skills, technology accessiblity, or initial thoughts regarding online learning that are not related to the social aspects in online learning. Therefore, it is crucial to develop a more contemporary instrument to measure distance learners' readiness by combining social, communication, and technical competencies, the most reliable predictors of online learning success factors such as learning outcomes, and learner satisfaction itself in an actual effort to improve the online learning experience and increase the retention of distance learners.

This study will first develop an instrument to measure social, communication, and technical competencies and will then evaluate the reliability and validity of this instrument. Further, for the future of the online learning, the instrument developed in this study shall be designed to provide a significant tool for online administrators in higher education as well as for distance learners.

CHAPTER 2. REVIEW OF THE LITERATURE

2.1 Introduction

Assessing the levels of distance learners' social, communication, and technical competencies to measure their readiness in online learning is the main focus of this study. For this reason, the literature on current issues in online learning, including student retention in online learning and the benefits and challenges of online learning, are reviewed in this chapter. Tinto's Student Integration Model (SIM) is introduced as a foundation of the theoretical framework for this study, and existing student readiness instruments have been reviewed as well. Additionally, literature on the key terms of this study, which are: a) social competencies; b) communication competencies; and c) technical competencies have been reviewed. Finally, the literature on learning outcomes and learner satisfaction is reviewed as a success indicator in online learning.

2.2 Online Learning

Online learning has been described as technology-based learning (Carnevale, 2000), web-based learning (Urdan & Weggen, 2000), network- and computer-based learning (Wentling et al., 2000), or "instructional environments supported by the Internet" (Bakia et al., 2012, p. 2). Meanwhile, Horton (2006) defined online learning as "the use

of information and computer technologies to create learning experiences" (p. 1), and Allen and Seaman (2011) defined online courses as courses that deliver at least 80 % of all course content online. Although each researcher uses different terms to describe the phenomenom of online learning, the common element in all of the research is that learners need to be familiar with using computer technology and the Internet to take online courses.

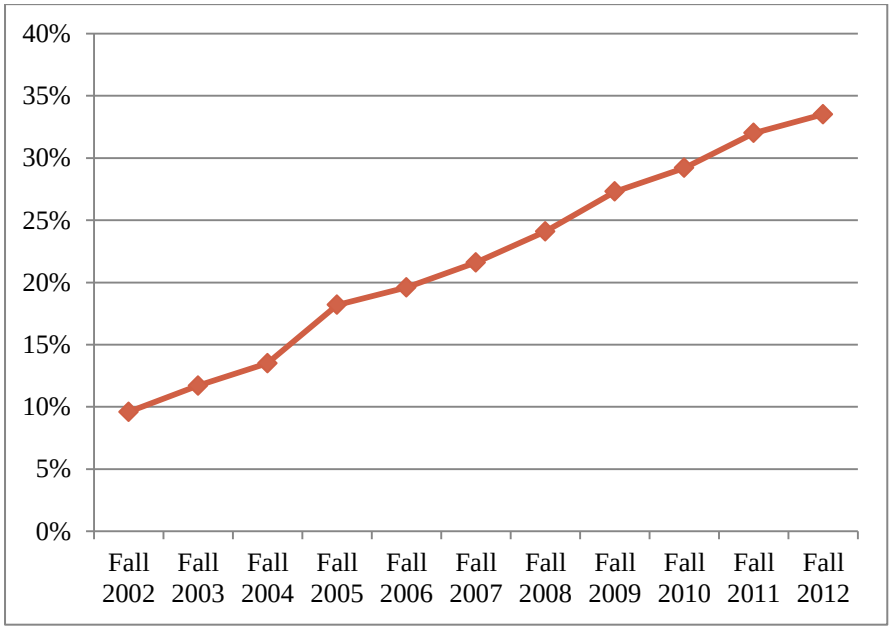

Figure 1. Online Enrollment as a Percentage of the Total Enrollment in the United States from 2002 to 2012

Online learning environments in higher education in the United States have been expanding rapidly (Allen & Seaman, 2014). As is shown in Figure 1 (Allen & Seaman, 2014, p. 15), online enrollment as a percentage of the total enrollments in U.S. universities was less than 10% in 2002, whereas it reached more than 33.5% in 2012. The benefit of online learning is that distance learners can study anytime anywhere at their

own pace without the limitations of time and space, a factor which led to the rapid growth of online learning. However, online learning is still confronted with a number challenges, such as student readiness for taking an online course and lower retention rates when compared to the traditional face-to-face course.

2.3 Benefits and Challenges of Online Learning

In response to the growth of online learning in higher education, a number of empirical studies have investigated the benefits and challenges of online learning, comparing it to traditional face-to-face classes. Bakia and her colleagues (2012) suggested three primary benefits of online learning for distance learners in their U.S. Department of Education Distance Learning Report. First, distance learners have access to high quality educational resources through online learning. Namely, online learning can provide learners with increased educational opportunities to study at a lower cost than that for the traditional face-to-face course (Appana, 2008; Coyner & McCann, 2004; Sabella & Hart, 2014). Second, online learning can provide a personalized learning environment for distance learners because their instructors are able to tailor the instructions depending on each students' particular study interests (Acker, Pearl, & Rissing, 2003; Twigg, 2003). Third, and most importantly, online learning can provide flexibility in time and location for students (Hammonds, 2003; Jun, 2005; Sabella & Hart, 2014). Distance learners do not need to spend their time commuting to campus, and they can study anytime and anywhere with computer access and Internet connections at their own pace (Davidson, 2005; Deal, 2002; Hammonds, 2003; Karber, 2003; Taylor, 2003). Distance learners can access course materials 24 hours a day and seven days a week, and

these course materials may include readings, discussion boards, the course gradebook, assignments and rubrics, or any supplemental materials (Coyner &McCann, 2004).

In addition, online learning can provide a learning environment for a multi-media learning experience (Davidson, 2005), timely or frequent instructors' feedback through Learning Management System (LMS) (Deal, 2002), and either synchronous or asynchronous communication tools including chat and discussion boards (Reeves & Brown, 2002). According to Reeves and Brown (2002), distance learners have more time to participate in the online discussions and to engage with instructors and classmates than do individuals involved in the traditional face-to-face classroom discussions. More importantly, international students have increased opportunities to contribute on the online discussions, because they can have an increased amount of time and greater ability to read other classmates' postings and to think deeply about the discussion topics or core concepts before they participate in the online discussions (Deal, 2002; Jun, 2005).

On the other side, several studies have classified various challenges of online learning, including: a) low retention rates (Ali & Leeds, 2009; Angelina, Williams, & Natvig, 2007; Holder, 2007; Lee & Choi, 2011), b) a greater responsibility for study and requirements of additional skills or competencies (Aragon, Johnson, & Shaik, 2002; Zawacki-Richter, 2004), and c) an absence of the sense of social belonging (Ma & Yuen, 2010). According to Karber (2003), learners tend to spend more time studying when they take an online course than they might with a traditional face-to-face course. Meyer (2003) also found that the learners who participated in online discussions needed to spend more time reading the others' postings, writing several questions, and participating in the discussion than they did in face-to-face discussion settings. Moreover, varied

technological issues – such as computer skills, technology accessibility, unfamiliarity with a new Learning Management System (LMS), or a poor Internet connection – can cause unplanned issues for distance learners (Davidson, 2005). For this reason, distance learners need to spend more time and effort in getting used to the technology employed and programs related to online learning (Coyner & McCann, 2004; Davidson, 2005). Technology costs, such as purchasing a computer or Internet connection, may result in another challenge for a student who desires to take an online course (Tayler, 2003).

2.4 Theoretical Framework

The theoretical framework for this study stemmed from the work of Tinto (1975) and his Student Integration Model (SIM), which determines factors that can increase students' retention. Although Tinto's work was based in face-to-face classes, the principles remain the same for learners in distance classes. He asserted that those students who are not sufficiently integrated into the social and academic aspects of a college or university tend to "dropout" or remove themselves from their purported plans of study. In other words, he stressed the importance of students' social and academic integration into their university life as an element necessary to decrease their dropout rate (Tinto, 1975; Tinto, 1998; Tinto, 2000; Tinto, 2005; Tinto, 2006; Tinto, 2008). In the SIM, which is the most influential model of student retention in higher education (McCubbin, 2003), Tinto (1975) elucidated which aspects and processes were related to the individual student's decision to leave the college or university and proposed five internal factors as significant predictors of student retention, which are: a) academic integration; b) social integration; c)

goal commitment; d) institutional commitment; and e) the learning community (p. 95) as shown in Figure 2.

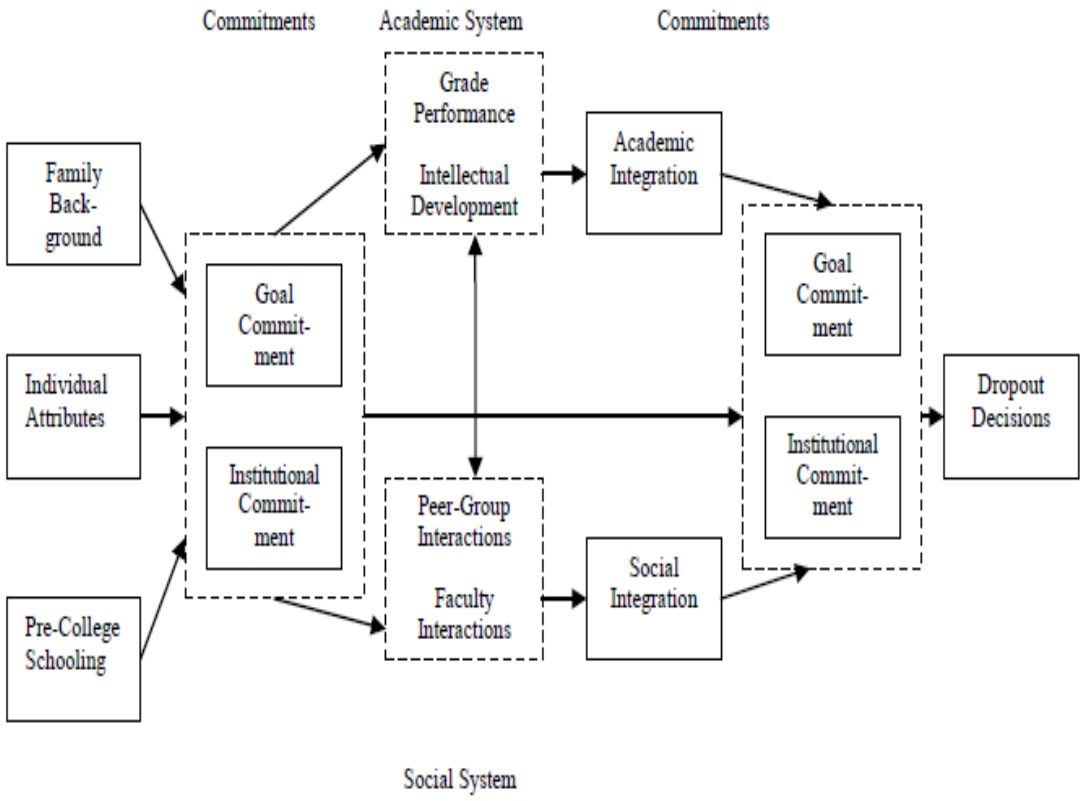

Figure 2. Tinto's Student Integration Model (SIM)

Tinto (1975) considered social integration and academic integration as the most significant factors for student retention among these five internal factors. He asserted that social integration consists of the student's quality of relationship with the course instructor and classmates, whereas academic integration relates to students' academic performance and their level of intellectual development (Tinto, 1975, Tinto, 1998; Tinto, 2000; Tinto, 2005; Tinto, 2006). In addition, Tinto (1975) claimed that the level of social

and academic integration have positive relationships with students' goal commitments and institutional commitments. In other words, students who achieve higher levels of social and academic integration tend to have strong goal commitments and institutional commitments and, as a result, tend not to drop out. Moreover, in the SIM, social integration plays a key role (Tinto, 1975; Tinto, 1998; Tinto, 2000; Tinto, 2005; Tinto, 2006; Tinto, 2008). Tinto (1975) asserted that the students' social integration, such as the students' interaction with course instructors and classmates, may enhance academic integration, help students to form learning communities, and resultantly increase student retention. Based on the SIM, Tinto also proposed three supports which have a positive effect on student retention – social support, academic support, and financial support (Tinto, 1975; Tinto, 1998; Tinto, 2000; Tinto, 2005; Tinto, 2008), and he proposed five conditions for student retention (Tinto, 2006) as is shown in Table 1.

Table 1

Five Conditions for Student Retention

Condition 1	Students are more likely to persist and graduate in settings that expect them to succeed.
Condition 2	Students are more likely to persist and graduate in settings that provide clear and consistent information about institutional requirements and effective advising about the choices students have to make regarding their programs of study and future career goals.
Condition 3	Students are more likely to persist and graduate in settings that provide academic, social, and personal support.
Condition 4	Students are more likely to persist and graduate in settings that involve them as valued members of the institution.
Condition 5	Students are more likely to persist and graduate in settings that foster learning.

While Tinto's model includes elements outside of the scope of this study, such as financial support, it is suitable as a theoretical framework and includes the major elements being studied. Furthermore, Tinto's SIM suggests that there is a significance in social integration, such as the students' interactions with instructors and classmates. In addition, communication competencies are an important element for enhancing student interaction with instructors and classmates (Dabbagh, 2007; Dray & Miszkiewicz, 2007). Last but not least, technical competencies are a substantial component for distance learners as it is the mediating element by which the others are implemented. Therefore, this study proposes the Student Online Learning Readiness (SOLR) Model as a new conceptual model for student retention in online learning that was inspired by Tinto's SIM as shown in Figure 3.

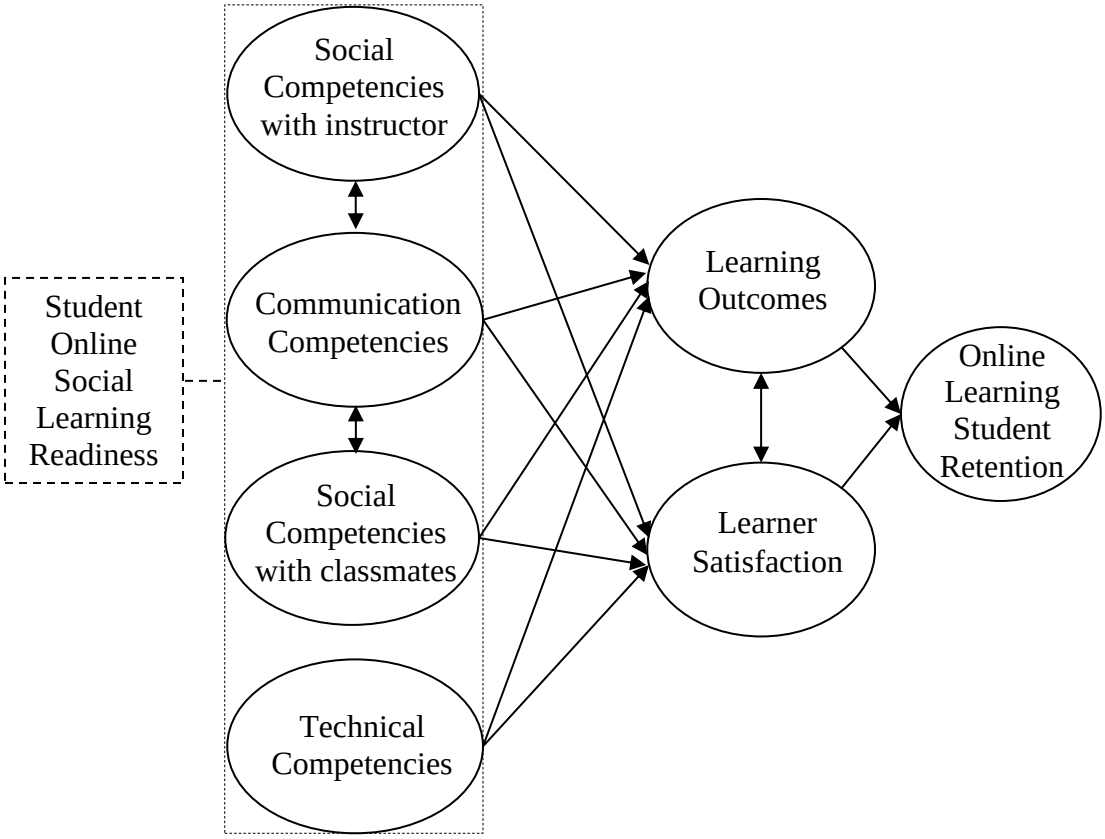

Figure 3. Student Online Learning Readiness (SOLR) Model

The Student Online Learning Readiness (SOLR) Model consists of four components believed necessary to measure student readiness for online learning, such as social competencies with the instructor, communication competencies, social competencies with classmates, and technical competencies. The positive relationships of each component with learning outcomes or learner satisfaction in an online learning environment have been verified by the previous research (e.g. social competencies with the instructor: Shen, Cho, Tsai, & Marra, 2013, communication competencies: Betermieux & Heuel, 2009, social competencies with classmates: Shen et al., 2013, and

technical competencies: Cho, 2012; Herrera & Mendoza, 2011). In addition, the influence of learning outcomes and learner satisfaction on student retention rates in online learning has been supported (Carey, 2011; Lee & Choi, 2013). That is, student readiness in online learning as measured by social competencies with the instructor, communication competencies, social competencies with classmates, and technical competencies plays a significant role in the enhancement of student retention in online learning in the Student Online Learning Readiness (SOLR) Model.

2.5 Student Retention and Online Learning

Student retention rates in online courses are significantly lower than that found with the traditional face-to-face courses (e.g. 20%: Ali & Leeds, 2009; Angelina, Williams, & Natvig, 2007; Holder, 2007; Lee & Choi, 2011; 25%: Poelhuber et al., 2008). For instance, Ali and Leeds (2009) argued that there is a 20% gap in student retention rates between online courses and the traditional face-to-face courses. In addition, Poelhuber and his colleague (2008) reported that 25% more students will abandon their online courses than will those students enrolled in the traditional face-to-face courses. For this reason, research has been conducted to uncover the reasons behind the higher dropout rates in online learning and to suggest feasible solutions in order to increase student retention rates. Regarding this retention disparity, Lee and Choi (2011) reviewed 33 empirical studies on student retention in online courses in higher education from 1999 to 2009, determined 41 factors that could have an effect on student retention in online learning, and sorted these into three categories and 9 sub-categories, as shown in Table 2 (p. 605-606). According to Lee and Choi (2011), over half of the previous studies --

analyzed had identified student factors (e.g. academic backgrounds, relevant experiences, relevant skills, and psychological attributes) as being related to student retention in online learning. Course/program factors (e.g. course design, institutional supports, and interactions) and environmental factors (e.g. work commitments, supportive study environments) were also determined to be a student retention factor in online learning.

Table 2

Forty-One Factors Relating to Student Retention in Online Learning

Categories	Sub-categories	Factors
Student factors	Academic background	• GPA • Previous academic performance • SAT math score
	Relevant experiences	• Educational level • Number of previous courses completed online • Number of previous distance learning courses • Previous experience in the relevant field • Involvement in professional activities in relevant field
	Skills	• Time management skills • Underestimation of the time required to balance academic and professional obligations • Ability to juggle roles/balancing multiple responsibilities • Strong coping strategies • Resilience • Relevant prior computer training • Computer confidence
	Psychological attributes	• Locus of control • Motivation • Goal commitment • Love of learning • Self-Efficacy • Satisfaction

Table 2

Forty-One Factors Relating to Student Retention in Online Learning (continued)

Categories	Sub-categories	Factors
Course/ Program factors	Course design	• Team-building activities • Program quality
	Institutional supports	• Administrative support • Student support infrastructure • Orientation • Tutorial attendance
	Interactions	• Inter-student interaction • Faculty interaction with students • Student participation
Environment factors	Work commitments	• Employment status • Work commitments • Increased pressure of work • Changes in work responsibilities and environments
	Supportive environments	• Financial aid • Support from family, work, friends • Emotional support • Supporting environments allowing study time • Life circumstances • Life challenger • Life events

Based on their review of the previous research, Lee and Choi (2011) also summarized the strategies to overcome the student retention issues in online courses as shown in Table 3 (p. 611-612). To overcome student factors (e.g. academic background, relevant experiences, skills, and psychological attributes), Lee and Choi (2011) asserted that a developed understanding of each student's challenges and potential should come before other specific strategies with the intent to better deal with the detailed issues. In addition, they claimed that the overall mission should be to provide quality course activities and well-structured supports (Lee & Choi, 2011). With respect to overcoming the environmental factors, they emphasized the importance of handling environmental issues and emotional challenges (Lee & Choi, 2011).

Table 3

Summary of Strategies to Overcome Dropout Factors in Online Learning

Categories	Sub-categories	Factors
Student factors	Academic background	• Provide high quality and responsiveness of academic advising
	Relevant experiences	• No strategies currently mentioned in the studies reviewed
	Skills	• Pre-assess students' skills • Administer the diagnosis of students' basic skills (e.g., writing, computer, mathematics, and critical thinking) before course registration and offer remedial courses or technical training if necessary • Provide computer training • Ensure that students are comfortable with technology and have good writing skills • Utilize a battery of autonomous assessment tools that can be scored immediately using computer adaptive assessment
	Psychological attributes	• Operate a screening procedure to determine students' locus of control

Table 3

Summary of Strategies to Overcome Dropout Factors in Online Learning (continued)

Categories	Sub-categories	Factors
Course/ Program factors	Course design	• Limit the class size to 20 students • Offer a cohort- and team-based learning experience with extensive faculty feedback and interaction • Provide content which is relevant to students' experiences and interests • Make course content flexible and self-directive for students to access and explore • Make curriculum more interesting and interactive to encourage student participation • Reinforce a teacher's role as a facilitator of interactive learning • Increase interaction in classroom using communication technology tools
	Institutional supports	• Identify at-risk students and provide them with appropriate training opportunities and guidance • Provide student orientation programs including training in the use and application of Internet technologies • Utilize advisers or tutors to support students • Provide staff trainings to qualify them to provide guidance and support in online courses to qualify them • Establish institutional student support infrastructure

Table 3

Summary of Strategies to Overcome Dropout Factors in Online Learning (continued)

Categories	Sub-categories	Factors
Course/ Program factors	Interactions	• Use technological tools to facilitate and promote peer interaction • Create online interaction forums that are compatible with these motivations to increase student–student interaction within an online course • Monitor students' involvement in learning activities and their continuous progress • Encourage extensive faculty feedback and interaction • Develop online learning community
Environment factors	Work commitments	• No strategies currently mentioned in the studies reviewed
	Supportive environments	• Use questionnaires to ascertain students' level of maturity and life challenger status • Identify students as early as possible who might be more at-risk for excessive personal demands • Have advisers trained to counsel students at a personal level • Provide counseling services that respond to emotional and health issues to meet students' need to feel socially connected not only to peers and faculty but also to staff at the institution • Supply resources to ease the trauma involved in dropout decision when a student comes to the conclusion that withdrawal is indeed the best action to take

Boston, Ice, and Gibson (2009) identified 45 significant factors that accounted for a high percentage of the variance in student retention rates in online courses. In their study, Boston and his colleagues analyzed the demographic, enrollment, and academic achievement data of 20,569 students at the American Public University System (APUS) to indentify which factors might influence student retention in online learning by conducting linear regressions. As a result, the number of transfer credits received by the students was determined as the most predictive factor for student retention in online learning. The total number of courses taken within the previous semester, each student's previous experience in receiving grades of 'F' or 'W', and his/her GPA were followed in turn. In their study, Boston and his colleague (2009) also proposed three solutions to overcome low retention rates in online courses, such as: a) new faculty training, b) community and connection in the classroom, and c) staff involvement. First, they asserted that the faculty who are new to teaching online should be trained through new faculty trating for a better understanding of online learning, the characteristics of student engagement, and the effective teaching strategies in an online course. Second, they also insisted that more interaction between instructors and students have a positive relationship with student retention in online courses. At least two direct interactions with students were recommended for distance instructors to improve student retention in online courses. Last but not least, they also insisted that not only faculty efforts but also staff involvements, such as school counselors, have a significant effect on student retention in online courses (Boston et al., 2009).

In addition, Rowntree (1995) reviewed four topics related to online learning in his study by reflecting on his teaching experience in an online course at Open University, as

follows: a) What is special about online courses? b) What is it like to teach and learn online? c) What is the role of the tutor? d) What are the snags? Based on his online teaching experience, he proposed that specific learner skills – such as computer literacy, information literacy, time management, reading and writing, and computer-based interaction – can all be significant factors for reducing the dropout rate in online learning (Rowntree, 1995). He particularly stressed the substantial influence of collaborative learning and technological issues existent in an online course on student retention (Rowntree, 1995).

In summary, there are various subjects that were determined to be significant factors through the previous research (e.g. learner characteristics, interaction in online courses, technological issues, and institutional supports). However, most of those factors can be converged on three competencies such as social competencies, communication competencies, and technical competencies. Many researchers emphasized the importance of student interactions with instructors and classmates in the online learning environment as an element to improve student retention and stated that social competencies can be an underpinning of interaction. Moreover, social competencies can be related to communication competencies either directly or indirectly. Last, and most importantly, online learning environments are substantially different from the traditional face-to-face courses. For this reason, a sizeable number of studies confirmed the positive relationship between technical competencies and student retention. Finally, based on the findings of the previous research, this study shall similarly consider social competencies, communication competencies, and technical competencies as a significant factor on student retention in online learning.

2.6 Review of Existing Student Readiness Instruments

The ongoing efforts of researchers have continued to measure student readiness in online learning, and a number of student readiness instruments in online learning have been used in higher education (Bernard, Brauer, Abrami, & Surkes, 2004; Dray & Miszkiewicz, 2007; Kerr, Rynearson, & Kerr, 2006; Mattice & Dixon, 1999; McVay, 2001; Parnell & Carraher, 2003; Watkins, Leigh, & Triner, 2004). However, most existing readiness instruments tend to focus only on technology access, online skills, and computer skills (Watkins et al., 2004; Dray et al., 2011).

As is shown in Table 4, most existing student readiness instruments have included basic computer skill questions (Bernard, Brauer, Abrami, & Surkes, 2004; Dray & Miszkiewicz, 2007; Mattice & Dixon, 1999; McVay, 2001; Parnell & Carraher, 2003; Watkins et al., 2004), learner characteristics (Bernard, Brauer, Abrami, & Surkes, 2004; Dray & Miszkiewicz, 2007; Kerr, Rynearson, & Kerr, 2006; Mattice & Dixon, 1999; McVay, 2001; Parnell & Carraher, 2003; Watkins et al., 2004), and demographic questions (Dray & Miszkiewicz, 2007; Mattice & Dixon, 1999). For instance, Bernard and his colleagues developed an online survey with 38 items to measure four categories of learner readiness in online education: a) readiness of online skills; b) readiness of self-management of learning and learning initiative; c) readiness of beliefs about DE/online learning; and d) desire for interaction with an instructor and/or other students (Bernard et al., 2004, p. 33).

Table 4

Summary of Existing Student Readiness Instruments

Authors	Name of Instrument	Number of Items	Main focuses
Bernard, Brauer, Abrami, & Surkes (2004)	Questionnaire for Predicting Online Learning Achievement	38	• Online skills • Self-management • Beliefs about online learning • Desire for interaction with instructors and classmates
Dray & Miszkiewicz (2007)	Online Learning Readiness Survey (OLRS)	40	• Demographic questions • Learner characteristics • Technology capabilities
Kerr, Rynearson, & Kerr (2006)	Test of Online Learning Success (TOOLS)	45	• Self-esteem • Learning styles • Metacognitive reading strategies • Intrinsic motivation • Academic locus of control
Mattice & Dixon (1999)	Distance Learning Survey	25	• Demographic questions • Learner characteristics • Technology capabilities • Online learning experience
McVay (2001)	Readiness for Online Learning Questionnaire	13	• Basic computer skills • Communication competencies • Independence as a learner
Parnell & Carraher (2003)	The Management Education by Internet Readiness (Mebir) Scale	12	• Technological mastery • Self-management • Beliefs about online learning • Anticipated quality of online course

Watkins, Leigh, & Triner (2004)	E-learner Readiness Self-assessment	27	• Technology access • Online skills and relationships • Motivation • Online audio/video • Internet discussions • Importance to own success

Because online learning is implemented in instructional environments with the Internet and computer technologies, technology elements of the readiness tests such as technology access, online skills, and computer skills can be considered as necessary requisites to taking an online course. However, these computer and technology skills are not enough to guarantee successful learning outcomes and learner satisfaction. For this reason, some existing student readiness instruments have also included other aspects of student readiness in online learning, such as learner characteristics, demographic information, or learning styles.

For instance, Dray and Miszkiewicz (2007) developed the Online Learning Readiness Survey (OLRS) and included three specific learner characteristics within the survey: a) psychological characteristics, b) learning style, and c) situational factors. In their study, Dray and Miszkiewicz (2007) also introduced nine subscales by which to measure learner characteristics more accurately, as follows: a) motivation; b) attitude; c) confidence; d) group work; e) independence; f) communication; g) commuting issues; h) schedule conflicts; and i) access. In addition, Dray and Miszkiewicz (2007) included some items to derive information about the distance learner's demographic information (e.g. age, gender, and ethnicity) because demographic characteristics such as age, gender, or ethnicity were considered to be one of the more influential factors on success in online

learning (Campbell, 2007; Campbell & Oblinger, 2007; Koch, 1998; Lim & Kim, 2002; Thurmond, Wambach, & Connors, 2002; Wojciechowski & Palmer, 2005). For instance, Campbell and Oblinger (2007) insisted that female, majority, or second generation students would tend to achieve better learning outcomes in online learning than would their male, minority, or first generation peers. Through their research, Thurmond, Wambach, and Connors (2002) confirmed that there was an influence of age on the distance learners' academic achievement.

Next, motivation was included in several student readiness instruments with regards to online learning (Dray & Miszkiewicz, 2007; Kerr, Rynearson, & Kerr, 2006; Watkins, Leigh, & Triner, 2004). Motivation has been considered a crucial learner characteristic for success in the online learning environment (Kanuka & Nocente, 2003; Lim & Kim, 2002; Piccoli, Ahmad, & Ives, 2001), as it has positive relations with learner satisfaction (Kanuka & Nocente, 2003; Piccoli, Ahmad, & Ives, 2001) and academic achievement (Lim & Kim, 2002). In addition, several existing student readiness instruments in online learning have contained items related to communication competencies (Dray & Miszkiewicz, 2007; McVay, 2001) and distance learners' interactions with their instructors and classmates (Bernard, Brauer, Abrami, & Surkes, 2004).

In summary, it has been revealed that the prevailing student readiness instruments employed in today's online learning are focused on asking computer or Internet related questions in order to measure the students' technological ability to access to an online course through use of a computer and Learning Management System (LMS). However, each student's access to an online course does not always guarantee that student's success.

In addition, most existing readiness instruments did not include social readiness although it is a significant factor in online learning. Therefore, other aspects – such as social, communication, and technical competencies – must also be considered as essential components of the student readiness instruments in online learning.

2.7 Social Competencies

A review of social competencies found that researchers have used different terms to describe this category which are dependent on the context. Caplan (2003) referred to social competencies in terms of a "perceived interpersonal competence" (p. 627), and Myllylä & Torp (2010) defined social competencies as "skills, competences, and the feeling of control that are essential for managing social situations and building and maintaining relationships" (p. 2795). "Social inclusion" (Dehinbo, 2008, p. 2385; Velupillai, 2007, p. 1), "social awareness" (Berman & West, 2008, p. 743), and "social-reliance" (Ransdell et al., 2011, p. 932) have also been used to represent social competencies. Gabriel et al. (2009) described social competencies as the ability "to continually develop and share ideas, promote their own position against contrary opinions and compromise despite linguistic and cultural barriers" (p. 1251). Even though researchers have used different terms to refer to social competencies, in many studies researchers have concluded that positive relationships between social competencies and academic achievement do exist (Anderson & Messick, 1974; Chen et al., 2010; Dalley, Bolocofsky, & Karlin, 1994; Tan et al., 2010).

While limited research has arisen regarding social competencies in online learning, most studies have focused on the effect of social competencies on academic achievement

(Yu, 2014). Yu (2014) applied three databases (e.g. Academic Search Premier (EBSCO), JSTOR, and Google Scholar) through use of the following keywords: social competencies, social skill, and online learning, and he found that only six papers were published related to social competencies in online learning between 2000 and 2012. According to his study, all six papers stated that there were positive relationships inherent between social competencies and the distance learners' academic achievement (Caplan, 2002; Dehinbo, 2008; Gabriel et al., 2009; Myllylä & Torp, 2010; Ransdell et al., 2011; Velupillai, 2007), whereas only one paper (Caplan, 2002) introduced a way to measure self-perceptions of social competencies as a means to evaluate the level of preference for online social interaction. In his study, Caplan conducted a survey regarding the students' perceived social benefits (e.g. "I am treated better in my online relationships than in my face-to-face relationships", "I am more confident socializing online than I am offline", "I feel safer relating to people online rather than face-to-face", "I am willing to give up some of my face-to-face relationships to have more time for my online relationships", "My relationships online are more important to me than many of my face-to-face relationships", and "I am happier being online than I am offline") and perceived social controls ("I can control how others perceive me when online" and "When I am online, I socialize with people without worrying about relational commitment") with 386 undergraduate students (Caplan, 2002, p. 561). Caplan (2002) concluded that there was a positive correlation between social competencies and academic achievement. Cronbach's alpha for internal consistency was .86.

In addition, Myllylä and Torp (2010) stated that the learner needs to develop new types of social skills, such as international collaboration and cross-cultural

communication, to better succeed in the online learning environment. In their qualitative study, Myllylä and Torp (2010) interviewed 27 students and found that there was positive relationship between online social environments and the students' social competencies. Comeaux, Huber, Kasprzak, and Nixon (1998) and Spector (1999) proposed that distance learners would need to develop their social learning skills to enhance their competencies in interacting with instructors or classmates, collaborating in groups, and building knowledge in online courses. Moreover, Spector (1999) introduced 11 initial principles for the creation of an online learning environment, where most of those principles were either directly or indirectly related to social competencies in online learning (e.g. foster a sense of a collaborative learning community, provide support for the collaborative construction of knowledge objects or for the collaboration construction and analysis of problem solutions, support mediation among all of the participants, and provide both public and private feedback support mechanisms).

Last but not least, Shen, Cho, Tsai, and Marra (2013) developed a new online learning self-efficacy scale following a literature review and verified the effect of specific social competencies, such as: a) self-efficacy to interact socially with classmates, and b) self-efficacy to interact socially with instructors, on learning satisfaction in the online learning environment. In fact, Shen and his colleagues (2013) made an initial item pool with 120 items, and they established a five factor model of an online learning self-efficacy scale with 30 items after an expert review and exploratory factor analysis, defined as follows: a) self-efficacy to complete an online course (8 items), b) self-efficacy to interact socially with classmates (5 items), c) self-efficacy to handle a course management system (6 items), d) self-efficacy to interact with an instructor in an online

course (5 items), and e) self-efficacy to interact with classmates (6 items). They asserted that the multidimensional online learning self-efficacy element of social interaction should be included to more accurately measure the varied students' online learning readiness, when employed along with technology issues such as computer skills (Shen et al., 2013).

In summary, although a series of researchers have stated that the positive relationship exists between social competencies and academic achievement in the online learning environments, those researchers did not use an instrument to measure social competencies but supported their statement through the literature review (Caplan, 2002; Dehinbo, 2008; Gabriel et al., 2009; Myllylä & Torp, 2010; Ransdell et al., 2011; Velupillai, 2007). Moreover, although Caplan (2002) introduced an instrument by which to measure social competencies, the main focus of his instrument was the relationship between Internet use and psychosocial well-being such as depression and loneliness (p. 554). However, in the case of Shen et al.'s (2013) online learning self-efficacy scale, the items to measure one's self-efficacy to interact socially with classmates and an instructor in an online course were well fitted for the purpose of this study, although these researchers used the term, "self-efficacy to interact socially" instead of "social competencies".

2.8 Communication Competencies

Communication competencies have been defined differently depending on the varied perspectives of the researchers. Within the sociolinguistic view, Hymes (1972) defined communication competencies as the knowledge to interact with other participants

at a social level and to successfully communicate by adapting to the specific communication situations. Backlund (1978), a communication educator, considered communication competencies as "the ability to demonstrate knowledge of the socially appropriate communicative behavior in a given situation" (p. 24). Other communication scholars have described communication competencies as a perception of competence which is formed with knowledge, skill, and motivation by the appropriateness of another's communicative behavior within various contexts (Rubin, 1983; Spitzberg, 1983). In addition, Spitzberg and Cupach (1984) referred to communication competencies as the "knowledge of cultural, social, and interpersonal rules for acceptability of behavior" (p. 67). Communication competencies were also defined as the ability to use knowledge, skills, and motivation to achieve the personal goal appropriately and effectively (Berko, Rosenfeld, & Samovar, 1997).

In the field of higher education, communication competencies have been studied as a predictor for learning outcomes in both face-to-face classroom settings and the online learning environment. Bassett, Whittington, and Staton-Spicer (1978) stated that communication competencies were related to learning and were required for college students to succeed within the college setting. In their study, Bassett and his colleagues (1978) proposed 19 communication competencies with four categories (i.e. communication codes, oral message evaluation, basic speech communication skills, and human relations) after analyzing the previous research on speech communication and other domains that are critical for high school graduates and similarly studying documents obtained from state agencies.

Dabbagh (2007) suggested that communication competencies were a vital factor in achieving better learning experiences in online learning from a review of the relevant literature. In her study, Dabbagh (2007) insisted that distance learning environments have been changing since the classic distance education setting (e.g. correspondence or home study). For this reason, different types of learner characteristics (e.g. interpersonal and communication competencies, social competencies, and technical competencies) are considered as a significant factor for the successful academic achievement in an online course. In addition, Dray and Miszkiewicz (2007) stated that communication competencies are one of the components which can be employed to measure the distance learners' readiness in online learning. Dray and Miszkiewicz (2007) included four items of communication competencies in their 20 item instrument to measure learner characteristics in online learning, as follows: a) I am comfortable expressing my opinion in writing to others, b) I am effective in communicating my opinion in writing to others, c) I am comfortable responding to other people's ideas, and d) I am good at giving constructive and proactive feedback to others. McVay (2001) also introduced 13-item student self-evaluation inventory and included two items to measure communication competencies in online learning environment, as follows: a) I am comfortable communicating electronically and b) I am willing to actively communicate with my classmates and instructors electronically.

Thach (1994) conducted a competency study for an online learning environment through use of the Delphi technique; communication competencies were identified as the most important competencies in distance education. Two round surveys were used in this study. For the first round survey, the total of 51 experts who were working in academic

institutions in both the United States and Canada participated and identified 51 competencies for success in online learning by use of an open-ended form. In the second round survey, 36 of 51 experts who participated in the first round survey responded and determined the top ten competencies in online learning according to a five-point Likert scale (e.g. Interpersonal Communication, Collaboration/Teamwork, Writing Skills, Feedback Skills, Planning Skills, Organizational Skills, Knowledge of Distance, Basic Technology Knowledge, and Technology Access Knowledge). In line with Thach's (1994) study, Williams (2003) conducted a subsequent study to find answers for two research questions by means of the Delphi technique: a) What Are the Roles and Competencies Necessary in Distance Education in Higher Education? b) How Do Distance Education Experts Rate the Importance of the Competencies? His results confirmed the previous findings of Thach (1994), and he similarly concluded that communication competencies play a major role in one's ability to succeed in learning in online education.

In summary, the positive influence of the distance learners' communication competencies on their learning outcomes in the online learning environments has been confirmed (Dabbagh, 2007; Dray & Miszkiewicz, 2007; Thach, 1994; Williams, 2003). However, while a relatively small body of literature was conducted on communication competencies in the context of online learning, many studies have been conducted in other areas, including a) linguistic communication competencies focusing on grammatical skills (Berger, Roloff, Roskos-Ewoldsen, 2010; Chomsky, 2006; Widdowson, 2007); b) the intercultural communication competencies (Samovar, Porter, & McDaniel, 2010; Tuleja, 2009); c) teacher's communication competencies (Daly & Vangelisti, 2003;

Mottet & Beebe, 2006; Wilson & Sabee, 2003); and d) manager's communication competencies in the business sector (Jurado, Eduardo, Luis, & Maribel, 2006; Pavitt, 1999; Rallis & Goldring, 2000). However, those areas were not included in this literature review because they were not directly related to distance learners' communication competencies in online learning. With respect to the instrument to measure the level of communication competencies in online learning, four items of Dray and Miszkiewicz (2007) and two items of McVay (2001) were well fitted for the purpose of this study because these items were developed to directly measure distance learners' communication competencies in online learning.

2.9 Technical Competencies

When the concept of "technical competency" was discussed in the literature, it was sometimes referred to as "technology proficiency" (Brzycki & Dudt, 2005, p. 623), "self-efficacy in technology" (Heo, 2011, p. 61), "technological abilities" (Herrera & Mendoza, 2011, p. 1080), "digital capability" (Mackey et al., 2012, p. 4745), and "computer self-efficacy" (Wang et al., 2012, p. 139). Hoy and Spero (2005) stated that the major concern of self-efficacy is not a person's actual ability, but a person's perception, and the studies on perceived technical competencies dominated the research. However, "technical competencies" is the primary term used in most studies reviewed, and a relatively large body of research deals with instructors' technical competencies in online learning environments (Baylora & Ritchie, 2002; Ben-Jacob, 2011; Brzycki & Dudt, 2005; FitzGibbon et al., 2012; Gibson, 2009; Mackey et al., 2012; McKimmy & Eichelberger, 2011; Orre, 2002).

With respect to the influence of learners' technical competencies on their academic achievement in online learning, Herrera and Mendoza (2011) proposed that technical competencies are significant predictors of learning outcomes in online learning for both teachers and students. In their study, Herrera and Mendoza (2011) interviewed 118 students with the purpose to compare students' perceptions of technology between social science students (n=56) and science students (n=62). Both student groups considered technical competencies as an important factor in online learning. In addition, more social science students reported that pedagogical processes are important than did the science students, whereas more science students responded that communication is important than did the social science students (Herrera & Mendoza, 2011). Ben-Jacob (2011) and Selim (2007) also confirmed that technical competencies are necessary components for success in online learning.

Moreover, technical competencies have been found to be one of the most influential elements of learners' academic achievement in online learning (Osika & Sharp, 2002; Selim, 2007; Watulak, 2012; Whale, 2006). Selim (2007) introduced 53 online learning critical success factors (CSFs), broken into four categories: instructor (13 items), information technology (13 items), student (22 items), and university support (5 items); he then tested his theory by analyzing survey data collected from 538 students. In his study, Selim (2007) investigated the connections between technical competencies and learners' motivation and found that there was a significant correlation between these two variables. Similarly, Whale (2006) confirmed that technical competencies positively affect learners' attitudes toward learning, and Wang et al. (2012) asserted that computer self-efficacy enhances the learners' perceived enjoyment of blogging and learning via the

Internet. Also, Watulak (2012) urged educators in higher education to pay attention to the necessity of providing technical support programs for their students. He argued that although current educators or administrators generally assume that most college or university students have high technical competencies when they take online courses, there are still students struggling with a technology barrier (Watulak, 2012).

A relatively small body of literature exists on technical competencies in the context of online learning (Osika & Sharp, 2002; Selim, 2007; Wang et al., 2012). Osika and Sharp (2002) proposed the use of fifteen technical skills as a scale by which to measure minimum technical competencies for online learning students. However, these technical skills have included too many basic items, such as the ability to "properly start and shut down a PC and send and receive e-mail" (p. 320). Since this paper was published ten years ago, it has become necessary to update these technical skills in order to more accurately determine minimum technical competencies necessary for the current online learning environments. Selim (2007) also introduced an information technology instrument, which consists of 13 items to measure students' technical competencies, as follows: a) Easy on-campus access to the Internet, b) Did not experience problems while browsing, c) Browsing speed was satisfactory, d) Overall, the website was easy to use, e) Information was well structured/presented, f) I found the screen design pleasant, g) I could interact with classmates through the web, h) I could easily contact the instructor, i) I can use any PC at the university using the same account and password, j) I can use the computer labs for practicing, k) I can rely on the computer network, l) I can register for courses on-line using Banner, and m) Overall, the information technology infrastructure

is efficient (p. 411). However, these items may also be too much technology-skill oriented than are the technical competencies required in online learning.

In addition, Wang et al. (2012) developed a seven item technical competencies instrument that consisted of computer self-efficacy (CSE) and personal innovation in information technology (PIIT). Three items are included in computer self-efficacy (e.g. "I would be confident in blogging even if there was no one around to show me how to blog", "I would be confident in blogging even if I had never blogged before", "I would be confident in blogging if someone showed me how to blog first"), and four items are relevant to personal innovation in information technology (e.g. "If I heard about a new information technology, I would look for ways to experiment with it", "Among my peers, I am usually the first to try out new information technologies", "In general, I am hesitant to try out new information technologies", "I like to experiment with new information technologies").

In summary, the significant influence of distance learners' technical competencies on their learning outcomes in online learning has been verified (Ben-Jacob, 2011; Herrera & Mendoza, 2011; Osika & Sharp, 2002; Selim, 2007; Watulak, 2012; Whale, 2006). However, with regard to the instrument to measure the level of technical competencies in online learning, the principle items in the existing instruments were outdated or technology-skill oriented. For this reason, it is necessary to develop a new instrument by which to measure the distance learners' technical competencies – one of the most significant predictors of learning outcomes in online learning.

2.10 Learning Outcomes and Learner Satisfaction

"Learning outcomes" are often referred to by similar terms such as "learning achievement" (Eom et al., 2006; Hytti, Stenholm, & Heinonen, 2010; Trigwell & Prosser, 1991; Winberg, & Hedman, 2008), "academic achievement" (Caprara et al., 2008; Cassidy & Eachus, 2000; Diseth, 2007; Matthews, D. B., 1996; Pimparyon et al., 2000; Weisz & Stipek, 1981), or "academic outcomes" (Lizzio, Wilson, & Simons, 2002). In most studies, with regard to both the traditional face-to-face classes and online learning courses, learning outcomes are measured by the students' grade point averages (GPA) and are used to evaluate the effectiveness of the instructors' teaching or learning environments (e.g. Al-Krenawi & Lightman, 2000; Caprara et al., 2008; Gurlitt & Renkl, 2010; Jung et al., 2002; Lizzio et al., 2002; Pimparyon et al., 2000; Sobral, 2001).

Learner satisfaction, another common measure in online learning, indicates how much a learner likes a course as well as how effectively the learning experience is delivered to the learners based on their perceptions (Allen et al., 2002; Eom et al., 2006; Jung et al., 2002; Chen, Lin, & Kinshuk, 2008). In such studies, "learner satisfaction" is also called "student satisfaction" (Allen et al., 2002; Arbaugh, 2001; Richardson & Swan, 2003; Lin, Lin, & Laffey, 2008; Swan, 2001; Wise et al., 2004).

With respect to the importance of learner satisfaction in online learning, a number of studies have been conducted. Allen et al. (2002) compared student satisfaction between traditional face-to-face classes and online courses by employing a meta-analysis of the empirical literature, and it was found that students in face-to-face classes reported a slightly higher level of satisfaction than did distant learners. Swan (2001) determined that "clarity of design, interaction with instructors, and active discussion among course

participants" (p. 306) to be factors which have an effect on student satisfaction in online learning. In her survey, she directly asked about students' satisfaction in courses through use of a four-point Likert scale. For example, regarding satisfaction with a course, she asked a question, "Compared to classroom-based instruction, how would you rate your level of activity in this course?" and students answered among four choices (e.g. "very satisfied", "satisfied", "not very satisfied", "not satisfied"). Lin, Lin, and Laffey (2008) surveyed 110 distance learners at a mid-west state university and found student satisfaction in online courses was positively correlated to learners' perceived task value, self-efficacy, and social ability. To measure student online learning satisfaction, Lin et al. (2008) used a four-item instrument with a 7-point Likert scale (from 1=strongly disagree to 7=strongly agree), as follows: a) I developed knowledge and competencies in this course, b) The course activities were a good fit for the way I like to learn, c) The course activities met my expectations for what I had hoped to learn, and d) The knowledge and competencies taught through the course activities are personally meaningful and important to me (Lin, 2005, p. 60). Cronbach's alpha for internal consistency was .88.

Moreover, Arbaugh (2000) proposed a 12-item scale for student satisfaction. In this scale, he generated items from three different categories, which were: a) satisfaction with the course taken via the Internet; b) perception of its quality; and c) likelihood of taking future courses via the Internet (p. 43). Richardson and Swan (2003) proposed a six-point Likert scale to measure student satisfaction with the instructor and found a positive correlation between social presence in online learning and student satisfaction with the instructor. Arbaugh (2001) also developed an instrument to assess

student satisfaction in online learning which focused on two factors, “satisfaction with the delivery medium” and “satisfaction with the course”
(p. 44). Wise et al. (2004) measured student satisfaction in online learning through use of 11 items, among which were “perceived course quality, satisfaction with course features, and benefits of the learning experience” (p. 18).

2.11 Summary

After conducting a thorough literature review, it was found that social, communication, and technical competencies are all highly associated with academic learning outcomes and learner satisfaction in online learning. However, a number of challenges in online learning were also explored, such as: lower retention rates and lower perceptions of social presence in online learning than in the traditional face-to-face classroom learning environment, and greater requirements or responsibilities to succeed in online learning. For this reason, a substantial amount of research was focused on developing an instrument with which to measure student readiness in online learning in line with the importance of measuring and reinforcing the level of student readiness itself.

However, although a number of readiness tests were established to measure student readiness in online learning, existing readiness tests focus mainly on basic computer skills, Internet access or online skills and nobody takes or thought about the significance of social readiness in online learning. Therefore, it is necessary to develop a new instrument designed to measure student social readiness in online learning, which combines social, communication, and technical competencies as essential elements of the instrument.

CHAPTER 3. METHODS

3.1 Introduction

The main purpose of this study is to develop and validate a student readiness instrument to measure the social, communication, and technical competencies of distance learners. To do this, an exploratory factor analysis and a reliability analysis of the pilot items were conducted. Initially, an exploratory factor analysis was executed to investigate the internal structure of the instrument and to remove some items that loaded on the wrong factor or cross-loaded on multiple factors. Secondly, a reliability analysis was conducted to test the reliability of the pilot items. The candidate questionnaire consists of 22 self-reported items on a five-point Likert scale (social competencies with instructor: five items, social competencies with classmates: five items, communication competencies: six items, and technical competencies: six items).

3.2 Research Context

A survey was created and administered using the Purdue Qualtrics system, and the survey links were distributed through Blackboard Learn in the Spring 2014 semester. Twelve online courses at Purdue University were selected across program areas, including social science, engineering, agriculture, and others, in order to reduce possible

bias in competencies levels among learners in a particular program as shown in Table 5. All online courses selected for this study had the following features: a) students were undergraduates; b) the courses were only offered online; c) class assignments and exams were implemented in Blackboard Learn; and d) all instruction was conducted by using Blackboard Learn. The total enrollment of the largest class and the smallest class were 200 and 2 respectively. The highest response rate was 85%, whereas the lowest response rate was 20%. Data were checked for duplicate responses by comparing participating student names and email addresses, and duplicate responses were removed. The average response rate was 51.54%.

Table 5

Numbers of Students and the List of Courses Participated in This Study

Course code	Course name	# of students enrolled	# of participating students	Response rate
AGR 201	Communication Across Culture	27	21	77.78%
OLS 299	Organizational Leadership and Supervision	23	10	44%
HDFS 280	Diversity in Individual and Family Life	24	7	29.17%
HIST 152	U.S. History since 1877	199	169	85%
HIST 103	Introduction to the Medieval World	50	38	76%
ME 270	Basic Mechanics	21	8	38.10%
ANTH 100	Introduction to Anthropology	50	25	50%
CS 180	Problem Solving and Object Oriented Programming	2	1	50%
ECE 201	Linear Circuit Analysis	40	8	20%
PSY 240	Introduction to Social Psychology	28	12	42.86%
PSY 335	Stereotyping and Prejudice	29	16	55.17%
MUS 2250	Music Appreciation	31	16	51.61%
Total		645	333	51.64%

3.3 Participants

There were 331 students who participated in this study and their majors included psychology, industrial engineering, animal science, computer science, political science, management, and communications. In terms of the academic levels of the participating students in this study, 47.1% of students were seniors, 20.5% were juniors, 17.8% were sophomores, and 14.5% were freshmen, as is shown in Table 6. One hundred and eighty seven female students (56.5%) and 144 male students (43.5%) participated in this study. The majority of the participating students in this study (96%) reported being in an age range of 18-23 years old. With respect to online learning experiences, 35.3% of the participating students answered that this was their first online course and 29.0% of students answered that they had taken at least two online courses, including this course, as is shown in Table 6. Therefore, from the table statistics, one may conclude that at least two thirds of the participating students had participated in one or two online courses, whereas one third of these students (35.6%) had taken more than two online courses.

Table 6

Demographic Information of the Students Participating in This Study

Demographic Categories	Frequency	Percent	Valid Percent	Cumulative Percent
Academic Level				
Freshman	48	14.5%	14.5%	14.5%
Sophomore	59	17.8%	17.8%	32.3%
Junior	68	20.5%	20.5%	52.9%
Senior	156	47.1%	47.1%	100.0%
Gender				
Female	187	56.5%	56.5%	56.5%
Male	144	43.5%	43.5%	100.0%
Age				
Under 18	1	.3%	.3%	.3%
18-19	77	23.3%	23.3%	23.6%
20-21	136	41.1%	41.1%	64.7%
22-23	105	31.7%	31.7%	96.4%
24-25	5	1.5%	1.5%	97.9%
26-27	2	.6%	.6%	98.5%
Over 27	5	1.5%	1.5%	100.0%
Online Learning Experience				
1 online course	117	35.3%	35.3%	35.3%
2 online courses	96	29.0%	29.0%	64.4%
More than 2 online courses	118	35.6%	35.6%	100.0%
Total	331	100.0%		

3.4 Survey Instrument

From the review of literature, 22 self-reported items were selected for this study. The questionnaire used in the current study consisted of five items for the measurement of social competencies with the instructor in online learning (Shen et al., 2013, see Table 7), five items for the measurement of social competencies with classmates in online learning (Shen et al., 2013, see Table 8), six items for the measurement of communication competencies in online learning (Dray et al., 2011; McVay 2001, see Table 9), and six items for the measurement of technical competencies in online learning (Wozney et al., 2006, see Table 10). A five-point Likert scale (1=Disagree, 2=Tend to disagree, 3=Neutral, 4=Tend to agree, 5=Agree) was used for each item.

3.4.1. Social Competencies Measurement in Online Learning

The 10-item self-reported measurement of social competencies scale from Shen et al. (2013) was used to measure learners' perceived social competencies in this study. Originally, the Shen et al. (2013) online learning self-efficacy scale consisted of 30 items with five categories, such as: (a) self-efficacy to complete an online course (8 items); (b) self-efficacy to interact socially with classmates (5 items); (c) self-efficacy to handle tools in a Course Management System (CMS) (6 items); (d) self-efficacy to interact with instructors in an online course (5 items); and (e) self-efficacy to interact with classmates for academic purposes (6 items). However, five items of self-efficacy for interacting with instructors in an online course (Table 7) and five items of self-efficacy for interacting socially with classmates (Table 8) directly related to measuring social competencies in

online learning environment were selected for this study. These items were directly related to social competencies to enhance the distance learners' sense of belonging in online courses and had a positive relationship with academic achievement.

Table 7

Social Competencies with the Instructor Measurement in Online Learning (5 items)

Item code	Selected or modified items for this study
	How confident are you that you could do the following social interaction tasks with your INSTRUCTOR in the ONLINE course?
SCC1	Clearly ask my instructor questions.
SCC2	Timely inform the instructor when unexpected situations arise.
SCC3	Initiate discussions with the instructor.
SCC4	Express my opinions to the instructor respectfully.
SCC5	Seek help from the instructor when needed.

Note. SCC 1-5 from Shen, Cho, Tsai, & Marra (2013)

In the original Shen et al. (2013) online learning self-efficacy scale, an eleven point Likert-type scale (0=cannot do at all, 5=moderately confident can do, 10=highly confident can do) was used for evaluation, and the resulting Cronbach's alpha for internal consistency for each subscale was 0.93, 0.92, 0.93, 0.94, 0.93 respectively. However, a five-point Likert scale (1=Disagree, 2=Tend to disagree, 3=Neutral, 4=Tend to agree, 5=Agree) was used in this study. Permission to use the questionnaires from Shen et. al.'s (2013) study was obtained for use in this study.

Table 8

Social Competencies with Classmates Measurement in Online Learning (5 items)

Item code	Selected or modified items for this study
	How confident are you that you could do the following social interaction tasks with your CLASSMATES in the ONLINE course?
SCI1	Initiate social interaction with classmates.
SCI2	Socially interact with other students with respect.
SCI3	Develop friendship with my classmates.
SCI4	Apply different social interaction skills depending on the situation.
SCI5	Pay attention to other students' social actions.

Note. SCC 1-5 from Shen, Cho, Tsai, & Marra (2013)

3.4.2. Communication Competencies Measurement in Online Learning

To measure communication competencies in online learning, four items from the online learning readiness survey (OLRS) of Dray et al. (2011) and two items from McVay's (2001) student self-evaluation inventory were adapted for this study as is shown in Table 9. Dray et al.'s (2011) Online Learning Readiness Survey (OLRS) consists of 14 items which were derived from the literature related to the distant learner's readiness for online learning, as follows: a) Bernard et al., 2004; b) Mattice & Dixon, 1999; and c) McVay, 2001. According to Dray and Miszkiewicz (2007), three learner characteristics were each considered as a component for the online learning readiness survey (OLRS), including psychological characteristics (e.g. motivation, attitude, and confidence), learning style (group work, independence, and communication), and situational factors

(commuting issues, schedule conflicts, and access). Within these three learner characteristics, four items were designed to measure a distance learner's communication competencies, and these four items were selected from the Dray et al. (2011) online learning readiness survey (OLRS) for the purpose of this study.

Table 9

Communication Competencies Measurement in Online Learning (6 items)

Item code	Selected or modified items for this study
CC1	I am comfortable expressing my opinion in writing to others.
CC2	I am able to express my opinion in writing so that others understand what I mean.
CC3	I am comfortable responding to other people's ideas.
CC4	I give constructive and proactive feedback to others even when I disagree.
CC5	I am comfortable communicating electronically.
CC6	I am willing to actively communicate with my classmates and instructors electronically

Note. 1. CC1-4 from Dray, Lowenthal, Miszkiewicz, Ruiz-Primo, & Marczynski, 2011. 2. CC5-6 from McVay, 2001.

A four point Likert-type scale was used for Dray et al.'s (2011) online learning readiness survey (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree). Cronbach's alpha for internal consistency among the six items of self-efficacy subscale was 0.77, including:

a) I am comfortable expressing my opinion in writing to others;

b) I am able to express my opinion in writing so that others know what I mean;

c) I work well in a group;

d) I am good at completing tasks independently;

e) I am comfortable responding to other people's ideas;

f) I give constructive and proactive feedback to others, even when I disagree.

Permission to use the questionnaires from both Dray's and McVay's studies was obtained for use in this study.

McVay's (2001) original student self-evaluation inventory consisted of 13 items designed to permit learners to check their readiness in taking online courses. Two items related to communication competencies in online learning environment were selected from McVay's (2001) student self-evaluation inventory. In the original McVay's (2001) student self-evaluation inventory, a four point Likert-type scale (1=rarely, 2=sometimes, 3=most of the time, 4=all of the time) was used but Cronbach's alpha for internal consistency was not reported. However, a five-point Likert scale (1=Disagree, 2=Tend to disagree, 3=Neutral, 4=Tend to agree, 5=Agree) was used in this study.

3.4.3. Technical Competencies Measurement in Online Learning

As is shown in Table 10, six items were selected from the instrument by Wozney et al. (2006) and modified to measure distance learners' technical competencies because the original instrument was developed to measure teachers' technical competencies. The original instrument consisted of 33 items related to the teachers' attitudes and beliefs toward using computer technology in their classroom, such as "the use of computer technology in the classroom motivates students to get more involved in learning activities"

(p. 202). Wozney et al.'s (2006) original instrument consisted of four sections, as follows: a) professional views on computer technology; b) background, teaching style, and resources available; c) experience with computer technologies; and d) process of integration.

Table 10

Technical Competencies Measurement in Online Learning (6 items)

Item code	Original items (Wozney et al., 2006)	Selected or modified items for this study
TC1	I can apply what I know about technology in the classroom. I am able to use it as an instructional aid and have integrated computers into the curriculum.	I am competent at integrating computer technologies into my learning activities
TC2	I am extremely proficient in using a wide variety of computer technologies	I am proficient in using a wide variety of computer technologies
TC3	I am gaining a sense of self confidence in using the computer for specific tasks.	I have a sense of self confidence in using computer technologies for specific tasks
TC4	I am starting to feel comfortable using the computer.	I feel comfortable using computers
TC5	I am beginning to understand the process of using technology and can think of specific tasks in which it might be useful.	I can explain the benefits of using computer technologies in learning
TC6	The use of computer technology in the classroom motivates students to get more involved in learning activities.	I am motivated to get more involved in learning activities when using computer technologies

Survey items labeled TC1, 3, 4, and 5 were selected from the section of teacher's process of integration in Wozney et al. (2006). This section was designed to ask teachers about their perceptions of the process of integrating computer technology in teaching activities. Survey items labeled TC2 and TC6 were selected from the section on experience with computer technologies and the section on professional views of computer technology in Wozney et al. (2006) respectively. A six-point Likert scale (1=Strongly Disagree, 2=Moderately Disagree, 3=Slightly Disagree, 4=Slightly Agree, 5=Moderately Agree, 6=Strongly Agree) was used for the items in the professional views of computer technology section, where participants were asked to choose each item if it best described their technical competencies. However, because these original items were designed for teachers' technical competencies assessment, they were modified to measure learner's technical competencies in an online learning environment as shown in Table 10. In terms of internal consistency for the original scale, Cohen's Kappa was 0.86 for Wozney et al. (2006).

3.5 Data Analyses

The main purpose of this research phase was to examine the appropriateness of the items and the internal structure of the constructs that the instrument measure. For these reasons, an exploratory factor analysis was first conducted to evaluate the factor structure of the scale. Second, a reliability analysis on pilot items was executed to test the reliability of the preliminary questionnaire set.

3.5.1. Statistical Evidence of Validity with Exploratory Factor Analysis

Exploratory factor analysis (EFA) is a statistical method that increases the reliability of the scale by identifying inappropriate items that can then be removed. It also identifies the dimensionality of constructs by examining relations between items and factors when the information of the dimensionality is limited (Netemeyer, Bearden, & Sharma, 2003). For this reason, EFA is performed in the early stages of developing a new or revised instrument (Wetzel, 2011). Before performing EFA, measurement appropriateness for the 22 survey items was evaluated through use of descriptive statistics. To accomplish this, both the mean of all responses and the standard deviations (SD) per item were calculated. If the mean of an item was found to be close to either 1 or 5, eliminating it as inappropriate should be considered because it may decrease the standard of correlation among the rest of the items (Kim, 2011). Following this step, the normality in distribution was tested by examining skewedness and kurtosis before conducting an exploratory factor analysis. Since the normality of the distribution was confirmed, the exploratory factor analysis was conducted through use of the Statistical Package for the Social Sciences (SPSS, version 22).

In this study, four factors—social competencies with instructor, social competencies with classmates, communication competencies, and technical competencies—were used to determine the structural pattern of the preliminary question set along with a scree plot and eigenvalue (Thompson, 2004). Scree tests, which were introduced by Cattell (1966), plot eigenvalues against the number of factors in order to best determine where a significant drop occurs within factor numbers (Netemeyer, Bearden, & Sharma, 2003). The factor solution was determined based on the numbers of

eigenvalue that are greater than one (Kaiser, 1960). Following recommendations by Floyd and Widaman (1995), .30 was used as a factor loading criterion in EFA. Kass & Tinley (1979) recommended five to ten participants per item and Comrey & Lee (1992) claimed that a sample size of 200 is fair and 300 is good. In addition, Boomsma (1982) recommended a minimum sample size of 200 to achieve reliable results in factor analysis.

The process of exploratory factor analysis began with an initial analysis run to obtain eigenvalues for each factor in the data. Next, the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (KMO) test and Bartlett's Test of Sphericity were executed to determine construct validity and to confirm that the data collected for an exploratory factor analysis were appropriate. The KMO test was used to verify the sampling adequacy for the analysis, and the Bartlett's Test of Sphericity was used to determine if correlations between items were sufficiently large for EFA. Bartlett's Test of Sphericity should reach a statistical significance of less than .05 in order to conduct an EFA. If the results of the initial EFA show items which are loading on the wrong factors or cross-loading on multiple factors, those items are deleted in order and the EFA re-performed until a simple solution is achieved.

3.5.2. Reliability Analysis

The reliability of an instrument or questionnaire is concerned with the consistency, stability, and dependability of the scores (McMillan, 2007). For this reason, the internal consistency was tested using Cronbach's alpha for each competency in SPSS. If the alpha value is higher than 0.9, the internal consistency is excellent, and if it is at least higher than 0.7, the internal consistency is acceptable (Blunch, 2008). Excellent internal

consistency means that the survey items tend to pull together. In other words, a participant who answers a survey item positively is more likely to answer other items in the survey positively (Blunch, 2008).

3.6 Summary

Data for this study consisted of survey responses from students enrolled in twelve online courses in the Spring 2014 semester at Purdue University. The survey instrument examined students' social competencies with the instructor, social competencies with classmates, communication competencies, and technical competencies in online learning. Demographic data was also collected including academic level, gender, age, and online learning experience. To analyze the data, exploratory factor analysis and item analysis were conducted.

CHAPTER 4. RESULTS

4.1 Introduction

The purpose of the following analyses was to determine which set of items should appropriately be included in the readiness measurement based on the analyses of psychometric properties of the developed instrument measuring social competencies, communication competencies, and technical competencies. Additionally, the reliability and validity evidence of the developed instrument employed to measure social competencies, communication competencies, and technical competencies was calculated. Therefore, this section includes three results of the analyses, including: descriptive statistics, exploratory factor analysis for validity, and item analysis for reliability.

4.2 Descriptive Statistics

Table 11 shows the descriptive statistics, including the means, standard deviations, minimums, and maximums of the four proposed factors of the Student Online Learning Readiness (SOLR) instrument. It revealed that participating students had a high level of communication competencies (M=4.319), social competencies with the instructor (M=4.272), and technical competencies (M=4.249), whereas they felt a relatively low level of social competencies with classmates (M=3.707).

Table 11

Descriptive statistics of each element of the Student Online Learning Readiness (SOLR) instrument

	Mean	Std. Deviation	Skewed-ness	Kurtosis	Min	Max	N
Technical competencies	4.249	.846	-.910	.179	1	5	331
Social competencies with classmates	3.707	1.059	-.580	-.054	1	5	331
Social competencies w/ the instructor	4.272	.873	-.974	.633	1	5	331
Communication competencies	4.319	.807	-.945	.229	1	5	331
Total	4.128	.7055	-.86	.224	1	5	331

The minimum and maximum values were the same in all four competencies one and five respectively. In addition, the results supported the variables as normally distributed based on the degrees of Skewedness and Kurtosis because both were less than the absolute value of 1. The rule of thumb was also applied to test the normal distribution of the data because the number of sample is larger than 200 (Field, 2009). In the large sample, it is more important to visually assess the shape of the distribution shape visually than to test the statistical significance of Skewedness and Kurtosis (Field, 2009).

4.3 Exploratory Factor Analysis (EFA) for Validity

An exploratory factor analysis was conducted on the 22 items with a promax rotation using SPSS 22. Exploratory factor analysis is a statistical method employed to increase the reliability of the scale by identifying inappropriate items that can be removed and the dimensionality of constructs by examining the existence of relationships between items and factors when the information of the dimensionality is limited (Netemeyer, Bearden, & Sharma, 2003). In this study, the four factors (i.e., technical competencies, social competencies with classmates, social competencies with the instructor, and communication competencies) were used to determine the pattern of the structure in the 22 item measurement of the Student Online Learning Readiness (SOLR) instrument along with a scree plot and eigenvalue (Thompson, 2004).

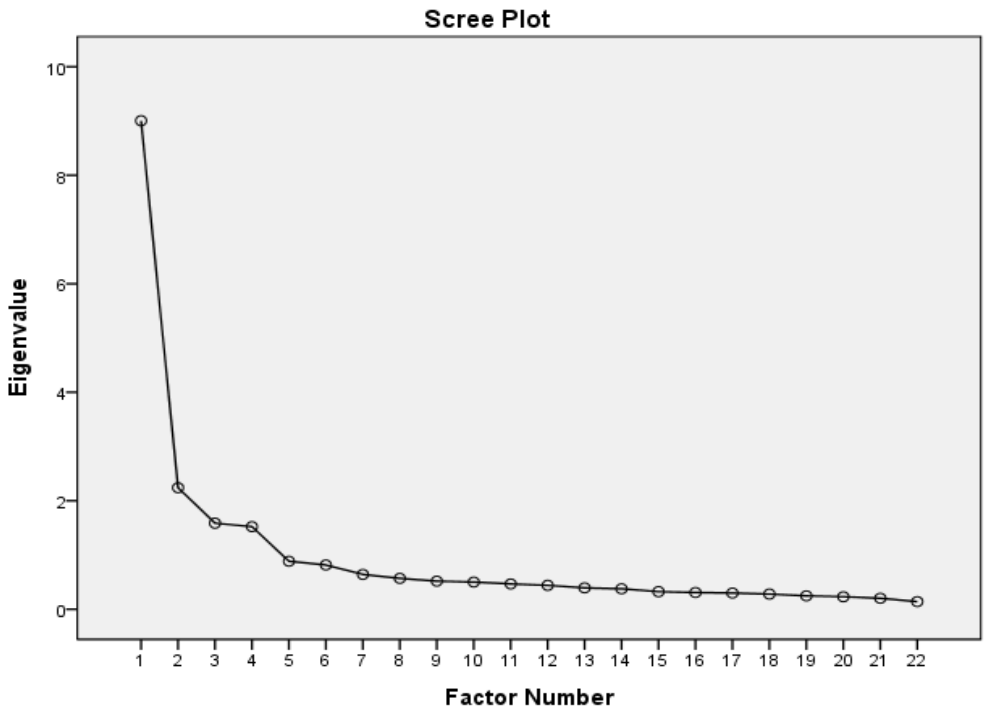

Figure 4. Scree Plot for the Student Online Learning Readiness (SOLR) Instrument

4.3.1. Preliminary Four-Factor Structure

An initial analysis was run to obtain eigenvalues for each factor in the data. The Kaiser-Meyer-Olkin Measure verified the sampling adequacy for the analysis, KMO=.914 which is above Kaiser's recommended threshold of .6 (1974). Bartlett's Test of Sphericity, $\chi 2$ (231) = 4364.42, $p < .000$, indicated that correlations between items were sufficiently large for EFA. Four factors had eigenvalues greater than one, as the scree plot clearly illustrates in Figure 4.

Table 12

Eigenvalues, Total Variances Explained for a Preliminary Four-Factor Structure

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	9.036	41.075	41.075	8.633	39.241	39.241	6.932
2	2.247	10.212	51.286	1.822	8.282	47.524	6.571
3	1.585	7.205	58.491	1.219	5.540	53.064	6.340
4	1.523	6.923	65.414	1.136	5.162	58.226	4.563

Note: Extraction Method: Principal Axis Factoring. a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

The initial 22-item structure explained 65.41% of the variance in the pattern of relationships among the items as shown in Table 12. The percentages explained by each factor were 41.075% (technical competencies), 10.212% (social competencies with instructor), 7.205% (communication competencies), and 6.923% (social competencies with classmate) respectively.

Table 13

The Items and Preliminary Four-Factor Structure of the Student Online Learning Readiness (SOLR) Instrument

	Factor			
	1	2	3	4
Factor 1: Technical Competencies				
19. I have a sense of self confidence in using computer technologies for specific tasks.	.990			
18. I am proficient in using a wide variety of computer technologies.	.874			
20. I feel comfortable using computers.	.818			
21. I can explain the benefits of using computer technologies in learning.	.714			
17. I am competent at integrating computer technologies into my learning activities.	.633			
22. I am motivated to get more involved in learning activities when using computer technologies.	.478			
15. I am comfortable communicating electronically.	.432		.331	
16. I am willing to actively communicate with my classmates and instructors electronically.	.322		.317	
Factor 2: Social Competencies with the instructor *(How confident are you that you could do the following social interaction tasks with your INSTRUCTOR in the ONLINE course?)*				
6. Clearly ask my instructor questions.		.932		
8. Initiate discussions with the instructor.		.797		
10. Seek help from instructor when needed.		.745		
7. Timely inform the instructor when unexpected situations arise.		.680		
9. Express my opinions to instructor respectfully.		.628		

Factor 3: Communication Competencies	
11. I am comfortable expressing my opinion in writing to others.	.916
13. I am comfortable responding to other people's ideas.	.862
12. I am able to express my opinion in writing so that others understand what I mean.	.747
14. I give constructive and proactive feedback to others even when I disagree.	.727
Factor 4: Social Competencies with classmates *(How confident are you that you could do the following social interaction tasks with your CLASSMATES in the ONLINE course?)*	
3. Develop friendship with my classmates.	.781
5. Pay attention to other students' social actions.	.771
4. Apply different social interaction skills depending on situations.	.748
1. Initiate social interaction with classmates.	.720
2. Socially interact with other students with respect.	.376

Note: Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization. a. Rotation converged in 5 iterations.

Based on the results of the initial exploratory factor analysis, there were two items which loaded on two factors in the preliminary four-factor structure. Both items were initially hypothesized to load on the communication competencies of the initial Student Online Learning Readiness (SOLR) instrument, but they were also loading on technical competencies. The first item was *I am comfortable communicating electronically;* the factor loading on communication competencies was .331, and the cross-loading on technical competencies was .432. The second item was *I am willing to actively communicate with my classmates and instructors electronically*; the factor loading on

communication competencies was .317, and the cross-loading on technical competencies was .322.

4.3.2. Final Four-Factor Structure

The final four-factor structure in this study is composed of 20 items after deleting two items which cross-loaded on two factors. As is shown in Table 17, six items for factor 1 represent technical competencies, five items for factor 2 represent social competencies with the instructor, and five items for factor 3 represent social competencies with classmates, and four items for factor 4 represent communication competencies. The first item that was deleted was *I'm comfortable communicating electronically* because it had a factor loading of .331 on communication competencies and a cross-loading of .432 on technical competencies. The second item that was deleted was *I am willing to actively communicate with my classmates and instructors electronically* because the factor loading was under .32 factor loading (Tabachnick & Fidell, 2013).

Table 14

Eigenvalues, Total Variances Explained for the Final Four-Factor Structure

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	8.057	40.284	40.284	7.664	38.322	38.322	5.880
2	2.204	11.019	51.303	1.788	8.939	47.262	5.944
3	1.582	7.912	59.215	1.220	6.099	53.361	4.217
4	1. 495	7.474	66.689	1.118	5.590	58.951	5.317

Note: Extraction Method: Principal Axis Factoring. a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Finally, this 20-item structure was found to explain 66.69% of the variance in the pattern of relationships among the items as shown in Table 14. The percentages explained by each factor were 40.284% (technical competencies), 11.019% (social competencies with instructor), 7.912% (social competencies with classmate), and 7.474% (communication competencies) respectively. Moreover, three competencies (e.g. social competencies, communication competencies, and technical competencies) in this study were highly correlated to each other, as is shown in Table 15. The factor correlation between factor 1 (technical competencies) and factor 2 (social competencies with the instructor) was .612; the correlation between factor 2 and factor 3 (social competencies with classmates) was .456; the correlation between factor 3 and factor 4 (communication competencies) was .443; the correlation between factor 1 and factor 3 was .369; the correlation between factor 2 and factor 4 was .582; and the correlation between factor 1 and factor 4 was .550.

Table 15

Factor Correlation Matrix

Factor	1	2	3	4
1	1.000			
2	.612	1.000		
3	.369	.456	1.000	
4	.550	.582	.443	1.000

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

In the final four-factor structure of the Student Online Learning Readiness (SOLR) instrument, there was one item which was under .32 factor loading (i.e. *I am willing to actively communicate with my classmates and instructors electronically*). In fact, Tabachnick and Fidell (2013) suggested deleting those items under .32 factor loading for the better interpretation of the factor structure. These items are not considered to load significantly. However, when choosing to decide appropriately to delete the item under .32 factor loading, this study also examined the Cronbach's α if the item were to be deleted. Although deleting the item was associated with a decrease in α, the item was nonetheless deleted. The original Cronbach's α of factor 1 (technical competencies) was .887 and if the item (*I am willing to actively communicate with my classmates and instructors electronically*) is deleted, then the Cronbach's α of factor 1 would be decreased to .882. However, the .005 gap on the Cronbach's α is so minimal and might not be considered as significant. In addition, this item is not strong and shares a potential

cross-loading. For this reason, the item (*I am willing to actively communicate with my classmates and instructors electronically*) was deleted in this study.

Table 16

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item Total Correlation	Cronbach's Alpha if Item Deleted
I am willing to actively communicate with my classmates and instructors electronically.	25.49	16.493	.579	.882
I am competent at integrating computer technologies into my learning activities.	25.43	16.179	.722	.866
I am proficient in using a wide variety of computer technologies.	25.60	15.290	.733	.864
I have a sense of self confidence in using computer technologies for specific tasks.	25.58	15.256	.787	.857
I feel comfortable using computers.	25.31	16.512	.710	.869
I can explain the benefits of using computer technologies in learning.	25.68	15.601	.709	.867
I am motivated to get more involved in learning activities when using computer technologies.	25.98	15.294	.579	.888

Table 17

The Items and Final Four-Factor Structure of the Student Online Learning Readiness (SOLR) Instrument after Factor Reduction Procedures

	Factor			
	1	2	3	4
Factor 1: Technical Competencies				
1. I have a sense of self confidence in using computer technologies for specific tasks.	.988			
2. I am proficient in using a wide variety of computer technologies.	.858			
3. I feel comfortable using computers.	.771			
4. I can explain the benefits of using computer technologies in learning.	.677			
5. I am competent at integrating computer technologies into my learning activities.	.591			
6. I am motivated to get more involved in learning activities when using computer technologies.	.455			
Factor 2: Social Competencies with instructor *(How confident are you that you could do the following social interaction tasks with your INSTRUCTOR in the ONLINE course?)*				
7. Clearly ask my instructor questions.		.917		
8. Initiate discussions with the instructor.		.794		
9. Seek help from instructor when needed.		.753		
10. Timely inform the instructor when unexpected situations arise.		.671		
11. Express my opinions to instructor respectfully.		.630		
Factor3: Social Competencies with classmates *(How confident are you that you could do the following social interaction tasks with your CLASSMATES in the ONLINE course?)*				

12. Develop friendship with my classmates.	.773
13. Pay attention to other students' social actions.	.768
14. Apply different social interaction skills depending on situations.	.755
15. Initiate social interaction with classmates.	.718
16. Socially interact with other students with respect.	.378
Factor 4: Communication Competencies	
17. I am comfortable expressing my opinion in writing to others.	.891
18. I am comfortable responding to other people's ideas.	.811
19. I am able to express my opinion in writing so that others understand what I mean.	.754
20. I give constructive and proactive feedback to others even when I disagree.	.700

Note: Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization. a. Rotation converged in 5 iterations.

4.4 Item Analysis for Reliability

An item analysis was conducted to test the reliability of each factor of the Student Online Learning Readiness (SOLR) instrument. According to Blunch (2008), satisfactory internal consistency ranges from 0.7 to 0.9. All four factors on this scale had a high rating for reliability. The Cronbach's α for technical competencies, social competencies with the instructor, communication competencies, and social competencies with classmate were .882, .874, .871, and .823 respectively (See Table 18).

Table 18

Cronbach's Alpha for Each Element of the Student Online Learning Readiness (SOLR) Instrument

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of items
Technical competencies	.882	.890	6
Social competencies with classmate	.823	.825	5
Social competencies with the instructor	.874	.875	5
Communication competencies	.871	.872	4

4.5 Summary

The validity and reliability of the Student Online Learning Readiness (SOLR) instrument were examined in this study with exploratory factor analysis (EFA) and item analysis. The initial survey instrument included 22 items. However, based on the result of EFA, 20 items remained in the final solution. A four factor structure has been confirmed for the Student Online Learning Readiness (SOLR) instrument with the factors being social competencies with instructors, social competencies with classmates, communication competencies, and technical competencies, and it explained 66.69% of the variance in the pattern of relationships among the items. The reliability of all four factors was high with Cronbach's α greater than .823.

CHAPTER 5. DISCUSSION

5.1 Introduction

The purpose of this study has been to test the reliability and validity of the Student Online Learning Readiness (SOLR) instrument. It was verified that the internal consistency reliabilities of Student Online Learning Readiness (SOLR) instrument were excellent as a result of the item analysis of the items which separately belonged to each competency. Moreover, this study proved the validity of the Student Online Learning Readiness (SOLR) instrument with four-factor structures with technical competencies, social competencies with the instructor, communication competencies, and social competencies with classmate that was supported by the literature. Two research questions were asked in this study, as follows:

1. Which set of items should appropriately be included in the final instrument based on analyses of psychometric properties of the developed instrument that measures social competencies, communication competencies, and technical competencies?
2. What is the reliability and validity evidence of the developed instrument to measure social competencies, communication competencies, and technical competencies?

For the first research question, 22 items were included in the initial Student Online Learning Readiness (SOLR) instrument (social competencies with classmates: 5 items, social competencies with instructor: 5 items, communication competencies: 6 items, and technical competencies: 6 items). Then, as a result of the exploratory factor analysis, 20 items remained in the final Student Online Learning Readiness (SOLR) instrument (see Appendix D). The social competencies are divided into two subscales with respect to the literature, i.e. social competencies with the instructor and social competencies with classmates. Each social competency includes five items respectively. Communication competencies and technical competencies include four items and six items respectively. With respect to the second research question, the reliability and validity of Student Online Learning Readiness (SOLR) instrument have been verified in this study.

5.2 Discussion

As a result of exploratory factor analysis (EFA), four factor-structures of the instrument of student readiness in online learning explained 66.69% of the variance in the pattern of relationships among the items. All four factors had high reliabilities (all Cronbach's $\alpha > .823$). Twenty items remained in the final questionnaire after deleting two item which cross-loaded on multiple factors (social competencies with classmates: 5 items, social competencies with instructor: 5 items, communication competencies: 4 items, and technical competencies: 6 items). The four-factor structure of the Student Online Learning Readiness (SOLR) instrument has been confirmed through this study.

In addition, it was confirmed that the data included this study was appropriate in order to conduct a valid exploratory factor analysis (EFA) based on the descriptive statistics analysis. The 331-student sample size is large enough for the EFA because it was larger than the suggested sample size of 300 (Comrey & Lee, 1992). Based on the results of the exploratory factor analysis (EFA), this study has successfully achieved the simple solution with four-factor structures by deleting two items which cross-loaded on multiple factors. In the initial solution, factor 2 and factor 4 both can be seen to clearly represent social competencies with the instructor and social competencies with classmates respectively. However, two items cross-loaded on both factor 1 (technical competencies) and factor 3 (communication competencies), such as "I am comfortable communication electronically" and "I am willing to actively communicate with my classmates and instructors electronically." These two items were supposed to load on factor 3 (communication competencies). But, through the use of the word "electronically" it has been found that there may have been a cross-loading on both communication competencies and technical competencies. Moreover, the factor loadings of these items on factor 1 were .432 and .322, whereas .331 and .317 on factor 3. That is, these items had loaded on the wrong factor. Therefore, by deleting the items that was felt to have been loaded on the wrong factor (e.g. "I am comfortable communicating electronically" and "I am willing to actively communicate with my classmates and instructors electronically"), I believe that the final solution could be better achieved in this study.

During the first phase of the instrument development process, this study examined the reliability and validity of the instrument. Based on the results of EFA of this study, educators or administrators can use this Student Online Learning Readiness (SOLR)

instrument in order to discover a better understanding of the level of freshmen college students' online learning readiness by measuring three competencies; social, communication, and technical competencies. Moreover, when students come to understand their level of online learning social readiness, this may provide them with an opportunity to enhance their online learning social readiness before taking their first online courses. However, further research is necessary to examine the relationships existent among the latent and manifest variables by conducting a confirmatory factor analysis (CFA) (Schreiber, Stage, King, Nora, & Barlow, 2006).

The SOLR can provide student profiles for administrators or institutions which are looking to create student support structures for the success of distance learners in courses or programs. While these social, communication, and technical competencies have been previously verified as critical success factors for online learning in earlier research and the Student Online Learning Readiness (SOLR) instrument can be used by educators or administrators in higher education, there are other learning characteristics of distance learners which may have an effect on their successful learning outcomes and level of satisfaction in online education. Further research on these other factors is necessary.

5.3 Implications

5.3.1. Implications for Research

While online learning is becoming a common occurrence in higher education in the United States, it also has given rise to several problems, such as lower retention rates in online courses rather than face-to-face courses. As Tinto (1998) asserted, a low sense

of belonging in an online course is one of the significant factors related to lower retention rates in an online course. For this reason, it is necessary for educators or administrators to try and instill a sense of belonging for their distance students and to consider how to support their students in order to enhance their own sense of belonging in each online course. The new instrument developed and tested in this study provides a solution for these students. As a theoretical framework, Tinto's (1975) Student Integration Model (SIM) emphasized the importance of social competencies with instructors and classmates on student retention. However, it is harder to interact socially with instructors and classmates within the online learning environment than in the face-to-face classroom setting (Ma & Yuen, 2010). In addition, distance learners' retention rates are significantly less than traditional students' retention rates (Ali & Leeds, 2009; Angelina, Williams, & Natvig, 2007; Holder, 2007; Lee & Choi, 2011). Therefore, the levels of social competencies with instructors and classmates play a key role in online learning.

In addition, the results of this study have confirmed that the four factor structure of the Student Online Learning Readiness (SOLR) instrument which consists of four categories (i.e. social competencies with the instructor, social competencies with classmates, communication competencies, and technical competencies). This study was looking at two factors of social integration in Tinto's SIM and has introduced the Student Online Learning Readiness (SOLR) conceptual model with the purpose of extending Tinto's social integration to an online learning environment. The significant influences of social competencies (Chen et al., 2010; Parker et al., 2006; Williams, 2003), communication competencies (Betermieux & Heuel, 2009; Dabbagh, 2007; Dabbagh & Bannan-Ritland, 2005; Volery & Lord, 2000; Williams, 2003), and technical

competencies (Osika & Sharp, 2002; Selim, 2007; Watulak, 2012; Whale, 2006) have been verified by previous research. Therefore, it is now found to be possible to measure the levels of learners' social, communication, and technical competencies through use of the Student Online Learning Readiness (SOLR) instrument before the learners take an online course. Social, communication, and technical competencies are just three factors among other learner characteristics that have the positive effects on academic achievement in online learning environment, and these three competencies are not enough to guarantee for success in online learning. However, we still need to pay more attention to these learner competencies as a starting point of supporting for distance learners before they take an online course.

5.3.2. Implications for Practice

This study provides two suggestions for practice in the higher education field. First, it provides an idea to consider what types of psychometric properties should be measured for the better understanding of student social readiness in online learning. It is true that those technological issues such as computer skills, Internet connection, and navigating ability in the Learning Management System (LMS) have an impact because those are main components of the online learning environment. However, technological skills will not guarantee an improved learning experience alone. Although the online learning environment differs from the traditional face-to-face classroom learning environment, instructors and students still play a main role in the process of learning in an online course. This is why the educators and administrators in higher education need

to pay more attention to distance learners' competencies in online learning (e.g. social competencies, communication competencies, and technical competencies).

Second, this study provides a suggestion to consider what kinds of support is needed for distance learners to succeed in online learning. To improve the lower retention rate in online learning, institutional supports such as freshmen orientation before taking an online course are significant (Ali & Leeds 2009; Cho, 2012; Lee & Choi, 2011). The Student Online Learning Readiness (SOLR) instrument developed and validated in this study could provide a guide how to measure student competencies in online learning and what components should be included in their orientations or supports to enhance their student competencies in online learning.

5.4 Limitations

There were four limitations with regard to this study. The first limitation related to the analysis method. Exploratory Factor Analysis (EFA) is an advantageous statistical method used to examine the construct validity and psychometric properties of an instrument. However, because EFA is not a sufficient tool to test the theoretical foundations of the instrument, a Confirmatory Factor Analysis (CFA) should be conducted to further the knowledge in this area. The second limitation of this study is an essential sampling bias. The samples in this study were collected from the online courses at a single university. This sampling process might threaten the ability to generalize the results of this study although various samples were included from different majors or programs. The third limitation is a response bias in questionnaire design. The online survey was distributed with two sections. The first section consisted of 10 items for social

competencies and the second section included 12 items for communication and technical competencies. This type of survey formatting might cause acquiescence response bias because it is possible that participants tend to show the similar response patterns in a section. The last limitation in this study related to school setting because participants in this study were not in fully online program but rather just took an online course. Although the survey asked them to answer the questions as a current learner or potential learner in an online course, there are possibilities for participants to answer the questions based on experiences as both a face-to-face and a distance learner. For this reason, it is possible that different results might be found if this study were conducted with students in a fully online program.

5.5 Future Research

For future research, it is recommended that this study be repeated with students from multiple colleges or universities to overcome the statistical sampling bias. Another recommendation is to conduct a Confirmatory Factor Analysis (CFA) to test predictive validity of the Student Online Learning Readiness (SOLR) instrument because this study focused on Exploratory Factor Analysis (EFA) and reliability analysis to test the reliability and validity of the instrument. In addition, it is recommended that further research be conducted to compare student readiness between students enrolled in a fully online program and those that are taking a single online course. This study did not consider the possible effect on the research results depending on the reason why students took the online courses. A final suggestion is to extend this study to other significant success factors in online learning (e.g. motivation, self-efficacy) in order to better

measure student readiness in online learning more precisely and further refine the theoretical framework for the SOLR.

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APPENDICES

Appendix A IRB Approval Letter

PURDUE UNIVERSITY

HUMAN RESEARCH PROTECTION PROGRAM
INSTITUTIONAL REVIEW BOARDS

To:	JENNIFER RICHARDSON BRNG 3142
From:	JEANNIE DICLEMENTI, Chair Social Science IRB
Date:	08/02/2013
Committee Action:	**Exemption Granted**
IRB Action Date:	08/02/2013
IRB Protocol #:	1307013775
Study Title:	Developing an Instrument to Measure Student Competencies in e-Learning: Focusing on Social, Emotional, and Technical Competencies

The Institutional Review Board (IRB) has reviewed the above-referenced study application and has determined that it meets the criteria for exemption under 45 CFR 46.101(b)(1) .

If you wish to make changes to this study, please refer to our guidance "**Minor Changes Not Requiring Review**" located on our website at http://www.irb.purdue.edu/policies.php. For changes requiring IRB review, please submit an **Amendment to Approved Study** form or **Personnel Amendment to Study** form, whichever is applicable, located on the forms page of our website www.irb.purdue.edu/forms.php. Please contact our office if you have any questions.

Below is a list of best practices that we request you use when conducting your research. The list contains both general items as well as those specific to the different exemption categories.

General

- To recruit from Purdue University classrooms, the instructor and all others associated with conduct of the course (e.g., teaching assistants) must not be present during announcement of the research opportunity or any recruitment activity. This may be accomplished by announcing, in advance, that class will either start later than usual or end earlier than usual so this activity may occur. It should be emphasized that attendance at the announcement and recruitment are voluntary and the student's attendance and enrollment decision will not be shared with those administering the course.
- If students earn extra credit towards their course grade through participation in a research project conducted by someone other than the course instructor(s), such as in the example above, the students participation should only be shared with the course instructor(s) at the end of the semester. Additionally, instructors who allow extra credit to be earned through participation in research must also provide an opportunity for students to earn comparable extra credit through a non-research activity requiring an amount of time and effort comparable to the research option.
- When conducting human subjects research at a non-Purdue college/university, investigators are urged to contact that institution's IRB to determine requirements for conducting research at that institution.
- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not

submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit the written permission to the IRB prior to engaging in the research activities (e.g., recruitment, study procedures, etc.). This is an institutional requirement.

Category 1

- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit the written permission to the IRB prior to engaging in the research activities (e.g., recruitment, study procedures, etc.). This is an institutional requirement.

Categories 2 and 3

- Surveys and questionnaires should indicate
  - only participants 18 years of age and over are eligible to participate in the research; and
  - that participation is voluntary; and
  - that any questions may be skipped; and
  - include the investigator's name and contact information.
- Investigators should explain to participants the amount of time required to participate. Additionally, they should explain to participants how confidentiality will be maintained or if it will not be maintained.
- When conducting focus group research, investigators cannot guarantee that all participants in the focus group will maintain the confidentiality of other group participants. The investigator should make participants aware of this potential for breach of confidentiality.
- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit the written permission to the IRB prior to engaging in the research activities (e.g., recruitment, study procedures, etc.). This is an institutional requirement.

Category 6

- Surveys and data collection instruments should note that participation is voluntary.
- Surveys and data collection instruments should note that participants may skip any questions.
- When taste testing foods which are highly allergenic (e.g., peanuts, milk, etc.) investigators should disclose the possibility of a reaction to potential subjects.

Appendix B Cover Letter for Student Online Learning Readiness (SOLR) instrument

Dear Purdue students,
We ask that consider taking part in a research study aimed at demonstrating the levels of student readiness in online learning. By taking part in this project you will assist us in improving the types of supports that can or should be offered to students new to online learning.
This survey consists of 22 items concerned with your own experiences as you take an online course. Please respond for the online course you are currently taking and indicate which course your responses are for. As part of the IRB or Human Subjects approval process (IRB protocol #1307013775) and to ensure that your identity is secure data, such as names, will be handled by the office of Purdue University Extended Campus (PEC). You will not be identified in any way and results will be reported in aggregate form.

If you have any questions you can contact Dr. Jennifer Richardson at jennrich@purdue.edu, Taeho Yu at yu134@purdue.edu, or the IRB office at Purdue University irb@purdue.edu regarding protocol # 1307013775.

Name _____ (*Required)

Purdue email address _____ (*Required)

Course Name _____ (*Required)

Major_____

Academic level: 1. freshman, 2. sophomore, 3. junior, 4. senior, 5. graduate student

Age: 1. Under 18, 2. 18-19, 3. 20-21, 4. 22-23, 5. 24-25, 6. 26-27, 7. Over 27

Gender: 1. Male, 2. Female

Approximate number of college credits completed_____

Online Experience:
___This is my first online course
___I have taken two online courses including this course.
___I have taken more than two online courses including this course.

Appendix C Initial Version of Student Online Learning Readiness (SOLR) instrument for EFA

Categories	No.	Items
Social Competencies with Classmates		*How confident are you that you could do the following social interaction tasks with your CLASSMATES in the ONLINE course?*
	1	Initiate social interaction with classmates. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	2	Socially interact with other students with respect. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	3	Develop friendship with my classmates. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	4	Apply different social interaction skills depending on situations. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	5	Pay attention to other students' social actions. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree

Categories	No.	Items
Social Competencies with Instructor		*How confident are you that you could do the following social interaction tasks with your INSTRUCTOR in the ONLINE course?*
	6	Clearly ask my instructor questions. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	7	Timely inform the instructor when unexpected situations arise. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	8	Initiate discussions with the instructor. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	9	Express my opinions to instructor respectfully. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	10	Seek help from instructor when needed. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree

Categories	No.	Items
Communication Competencies		*Please answer the following questions as a current learner or potential learner in an online course.*
	11	I am comfortable expressing my opinion in writing to others. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	12	I am able to express my opinion in writing so that others understand what I mean. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	13	I am comfortable responding to other people's ideas. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	14	I give constructive and proactive feedback to others even when I disagree. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	15	I am comfortable communicating electronically. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree

16	I am willing to actively communicate with my classmates and instructors electronically. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree

Categories	No.	Items
Technical Competencies		*Please answer the following questions as a current learner or potential learner in an online course.*
	17	I am competent at integrating computer technologies into my learning activities. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	18	I am proficient in using a wide variety of computer technologies. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	19	I have a sense of self confidence in using computer technologies for specific tasks. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	20	I feel comfortable using computers. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree
	21	I can explain the benefits of using computer technologies in learning. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree

22	I am motivated to get more involved in learning activities when using computer technologies. o Disagree o Tend to disagree o Neutral o Tend to agree o Agree

Appendix D Final Version of Student Online Learning Readiness (SOLR) instrument

Factor	No.	Items
Factor 1: Technical Competencies	1	I have a sense of self confidence in using computer technologies for specific tasks.
	2	I am proficient in using a wide variety of computer technologies.
	3	I feel comfortable using computers.
	4	I can explain the benefits of using computer technologies in learning.
	5	I am competent at integrating computer technologies into my learning activities.
	6	I am motivated to get more involved in learning activities when using computer technologies.
Factor 2: Social Competencies with Instructor		*How confident are you that you could do the following social interaction tasks with your INSTRUCTOR in the ONLINE course?*
	7	Clearly ask my instructor questions.
	8	Initiate discussions with the instructor.
	9	Seek help from instructor when needed.
	11	Timely inform the instructor when unexpected situations arise.
	11	Express my opinions to instructor respectfully.
Factor 3: Social Competencies with Classmates		*How confident are you that you could do the following social interaction tasks with your CLASSMATES in the ONLINE course?*
	12	Develop friendship with my classmates.
	13	Pay attention to other students' social actions.
	14	Apply different social interaction skills depending on situations.
	15	Initiate social interaction with classmates.
	16	Socially interact with other students with respect.
Factor 4: Communication Competencies	17	I am comfortable expressing my opinion in writing to others.
	18	I am comfortable responding to other people's ideas.
	19	I am able to express my opinion in writing so that others understand what I mean.
	20	I give constructive and proactive feedback to others even when I disagree.

VITA

VITA

Taeho Yu

Purdue University
Department of Curriculum and Instruction
Learning Design and Technology Program

General Information

Academic Record

Ph.D., anticipated December 2014, Purdue University, Curriculum & Instruction, Learning Design and Technology

Dissertation Title: Exploratory Factor Analysis and Reliability Analysis of Student Online Learning Readiness (SOLR) instrument. M.S.Ed., December 2013, Purdue University, Curriculum & Instruction, Learning Design and Technology

M.P.I.A. Master of Pacific International Affairs, May 2008, University of California, San Diego (UCSD), Graduate School of International Relations and Pacific Studies (IR/PS); Specialization in International Politics

M.S., August 2004, Kyung-Hee University, Graduate School of Journalism and Communications; Specialization in Cyber Communications

B.A., August 2002, Kyung-Hee University, Department of Journalism and Communications

Academic Appointments

Online Course Development Consultant, Department of Curriculum and Instruction, Purdue University, August 2012 to Current

Educational Technologist, Gifted Education Resource Institute (GERI), at Purdue University, July 2011 to Current

Expert Member, Global Open Online University 3.0 Project, Kyung-Hee Cyber University, June 2013 to Current

Outside Researcher, Learning Analytics for Prediction and Action (LAPA) Project, Ewha Womans University, May 2013 to Current

Co-Instructor, Online Master Program of Learning Design and Technology, Purdue University, August 2013 to May 2014

Graduate Administrative Professional, Purdue Extended Campus, Purdue University, July 2013 to June 2014

Co-Instructor, Department of Curriculum and Instruction, Purdue University, August 2012 to December 2012

Graduate Teaching Assistant, Department of Curriculum and Instruction, Purdue University, January 2012 to May 2012

Instructor, Language and Culture Programs, University of California, San Diego (UCSD), September 2007 to December 2008

Co-Instructor, School of Journalism and Communications, Kyung-Hee University, March 2001 to June 2002

Research Appointments and Experience

Gifted Education Resource Institute (GERI) Project with Dr. Marcia Gentry & Dr. Jennifer Richardson from July 2014 to current at Purdue University

Project Title: Including data from Native American Youth in the Excellence Gap Literature

Purdue Course Signals Project with Dr. Matthew D. Pistilli, Dr. William Watson, & Dr. Sunnie L. Watson from September 2013 to current at Purdue University

Project Title: Investigating the Effect of Learning Analytics Interventions on Student's Self-efficacy and Learning Behaviors

Community of Inquiry (CoI) Research Project with Dr. Jennifer Richardson from June 2012 to current at Purdue University

Project Title: On the Relationships Between and Among Teaching Presence, Social Presence and Cognitive Presence

Learning Analytics for Prediction and Action (LAPA) Project with Dr. Il-Hyun Jo from May 2013 to Current at Ewha Womans University in Korea

Project Title: Developing Learning Analytics for Prediction and Action (LAPA) Program by Using Big Data Mining with Cyber Campus at Ewha Woman’s University

Kyung-Hee Cyber University Learning Analytics (KHCULA) Project with Dr. Yoonil Auh from August 2013 to Current at Kyung-Hee Cyber University in Korea

Project Title: Developing Student Care System with Learning Analytics Using Educational Data Mining at Kyung-Hee Cyber University

Gifted Education Resource Institute (GERI) Project with Dr. Marcia Gentry & Dr. Jennifer Richardson from May 2011 to July 2013 at Purdue University

Project Title: Developing Online Professional Development Modules for Teachers in Gifted Education

Purdue Optimization Modeling Education Tool (POET) Project with Dr. Ji Soo Kim & Jennifer Richardson from September 2011 to May 2012 at Purdue University

Project Title: Investigating the Use of Visualization to Effectively Teach Optimization Modeling Skills

Comcast Project with Dr. Jennifer Richardson from August 2010 to August 2011 at Purdue University

Project Title: Determining the Impact of Comcast on Demand Video Supplements on Learning for 6^{th} grade Science Students

Awards and Honors

- Frank B. DeBruicker Graduate Scholarship 2014, Purdue University
- Graduate Teacher Certificate (GTC), Purdue University (April, 2014)
- Executive Officer, Korean American Educational Researchers Association (2014-2015)
- Co-Chair, IAP-DDL Distance Education Best Practices Award for Association for Educational Communications and Technology (2012-2013)
- Nominated for the Purdue Graduate School Bilsland Dissertation Fellowship 2013, Purdue University
- Student Award Reviewer, Burmeister Award for Association for Educational Communications and Technology (AECT) National Convention, Louisville, KY (November, 2012)
- Member, Kappa Delta Pi (KDP), International Honor Society in Education (since 2011)
- Best Journalist Award, the Korea Daily in USA (2008)
- Merit Scholarship, University of California, San Diego (UCSD) (2006-2008)
- Merit Scholarship and Scholarship of Sam Song Scholarship Association (2002-2004)
- Teacher's Scholarship and Scholarship of Sam Song Scholarship Association (1998-2002)

Published Work and Research Activities

Journal Articles

Yu, T. (in preparation, 2014). Exploratory Factor Analysis and Reliability Analysis of Student Online Learning Readiness (SOLR) instrument: Focus on Social, Communication, and Technical Competencies. *Educational Technology Research and Development.*

Yu, T., & Richardson, J.C. (in press, 2014). Examining the Reliability and Validity of a Korean Version of the Community of Inquiry Instrument Using Exploratory and Confirmatory Factor Analyses. *The Internet and Higher Education.*

Jo, I., & **Yu, T.** (in preparation, 2014). Educational Technology Approach toward Learning Analytics: Relationship of Student Online Learning Behavior and Learning Outcomes in Higher Education. *The Internet and Higher Education.*

Shin, M., **Yu, T.**, & Kwak, S. (2013). Current Status of Media Literacy Education and Development Strategies for e-Learning in Social Media Era. *Journal of Cyber Society & Culture, 4*(1), 1-40.

Min, K., Shin, M., **Yu, T.**, & Kwak, S. (2013). Strategies for Revitalizing E-Learning Through Investigating the Characteristics of E-Learning and the Needs of Distance Learners in the Domestic Universities in Korea. *International Journal of Contents (IJOC), 4*(4), 101-110.

Book Chapters

Yu, T. (2014). Student Readiness for Online Learning: The Role of Social, Emotional, and Technical Competencies. In P. Lowenthal, C. York, & J. Richardson (Eds.), *Online Learning: Common Misconceptions, Benefits, and Challenges* (pp. 17-31). Hauppauge, NY: Nova Science Publishers.

Technical Reports

Yu, T (2013, September). *Research on New Paradigm of E-Learning Teaching Method: Focused on Teaching and Learning in Massive Open Online Courses.* Seoul, Korea: Kyung-Hee Cyber University.

Yu, T. (2013, July). *Exploring Cyber University Students' Perceptions of Online Learning: Focused on Perceived Level of Social, Cognitive, and Teaching Presences*. Seoul, Korea: Kyung-Hee Cyber University.

Min, K, Shin, M., **Yu, T.**, & Kwak, S. (2013, February). *Developing a Media Literacy Education Program to Invigorating E-Learning*. Seoul, Korea: Institute of Cyber Society at Kyung-Hee Cyber University.

Richardson, J.C., **Yu, T.**, Kozan, K., Olesova, L., & Koehler, A. (2011, June). *Determining the Impact of Xfinity on Demand Video Supplements on Learning 6th Grade Science*. West Lafayette, IN: Purdue University.

Refereed Conference Proceedings

Yu, T., & Richardson, J.C. (2014). Examining the Predictive Validity of a Korean Version of the Community of Inquiry Instrument Using Confirmatory Factor Analyses. 37th Annual Proceedings of *Association for Educational Communications and Technology*. Jacksonville, FL: AECT.

Yu, T., Koehler, A., & Richardson, J.C. (2014). Examining the Relationship between Student Online Learning Behavior and Academic Achievement in a Learning Management System. 37th Annual Proceedings of *Association for Educational Communications and Technology*. Jacksonville, FL: AECT.

Yu, T. (2014). Developing an Instrument to Measure Student Competencies in E-Learning: Focused on Learner Characteristics and Technical Competencies. 37th Annual Proceedings of *Association for Educational Communications and Technology*. Jacksonville, FL: AECT.

Yu, T., & Jo, I. (2014). Educational Technology Approach toward Learning Analytics: Relationship between Student Online Behavior and Learning Performance in Higher Education. Proceedings of *International Conference on Learning Analytics and Knowledge (pp269-270).* Indianapolis, Indiana: LAK.

Yu, T. (2014). Social, Emotional, and Technical Competencies in e-Learning: A Literature Review. Proceedings of *American Educational Research Association 2013 - The Power of Education Research for Innovation in Practice and Policy*. Philadelphia, Pennsylvania: AERA.

Jo, I., & **Yu, T.**, Lee, H. (2014). Relations between Student Online Learning Behavior and Academic Achievement in Higher Education: A Learning Analytics Approach. *The International Conference on Smart Learning Environments 2014.* Ting Kok, Hong Kong: ICSLE2014.

Yu, T., & Richardson, J.C. (2013). Testing a Measure of the Community of Inquiry in Korean Using a Multi-institutional Sample in Korea. In M. Simonson (Ed.), 36th Annual Proceedings of *Association for Educational Communications and Technology (Vol.1, pp278-284).* Anaheim, CA: AECT.

Jo, I., & **Yu, T.** (2013). Relationship of Student Online Behavior and Learning Performance in Higher Education: A Learning Analytics Approach. Proceedings of *e-Learning Korea 2013 Conference*, Seoul, Korea.

Richardson, J.C., Kozan, K., Mutlu, N. and **Yu, T.** (2013). On the Relationships between and among Teaching Presence, Social Presence and Cognitive Presence. Proceedings of *American Educational Research Association 2013 - Education and Poverty: Theory, Research, Policy and Praxis*. San Francisco, California: AERA.

Yu, J. H., Kim, W., **Yu, T.**, & Richardson, J.C. (2011). Community of Inquiry in an Education-based Social Network Site: An Exploratory Study. In M. Simonson (Ed.), 34th Annual Proceedings of *Association for Educational Communications and Technology (Vol.1, pp294-302).* Jacksonville, FL: AECT.

Teaching Experience

Purdue University West Lafayette, IN
Co-Instructor January 2014-May 2014

- EDCI531 – Learning Theory and Instructional Design
- *Course description:*

  "This course has been designed to help you learn how theories of human learning and motivation can be applied to the instructional process in order to make it more effective, efficient, and/or appealing. The focus of the course throughout the term will be on two areas: 1) the theoretical principles that have contributed to the field of Instructional Design (ID), and 2) how those principles can be applied within practical settings. Reading and studying the assigned chapters and articles will acquaint you with the key theories. The discussions and writing assignments will focus on the application of the derived principles."
- Responsibilities: teaching online lectures, grading students' assignments including individual and group works and providing instructor's feedback on their grades, grading and facilitating online discussions, interacting and communicating with distant students, discussing and deciding how to teach the course with main instructor regularly, and holding the online help sessions for distant students

Purdue University West Lafayette, IN
Co-Instructor August 2013-December 2014

- EDCI672 – Advanced Practices in Learning Systems Design
- *Course description:*

  "This course is a case-based approach to learning instructional design (ID) skills. Students in EDCI 67200 engage in authentic design activities via participation in a

community of practice, simulating an ID apprenticeship shop. As with the traditional apprenticeship approach, it is acknowledged that each member of the shop has skills and knowledge from which others can benefit. ID apprentices benefit by co-analyzing instructional design problems, having access to a wide range of ideas and perspectives, working with diverse teams and individuals, creating real instructional design products or cases, and giving and receiving constructive feedback."

- Responsibilities: teaching online lectures, grading students' assignments including individual and group works and providing instructor's feedback on their grades, grading and facilitating online discussions, interacting and communicating with distant students, discussing and deciding how to teach the course with main instructor regularly, and holding the online help sessions for distant students

Purdue University West Lafayette, IN
Co-Instructor August 2012-December 2012

- EDCI575 - Foundations of Distance Education
- *Course description:*

  "This course is an introduction to the field of distance learning/education. We will examine basic concepts and principles of distance learning, the theoretical underpinnings of the field, research and application literature, and distance education delivery technologies. A systematic approach to the design, development, delivery, and evaluation of instruction for learners at a distance is emphasized. Special attention is given to Internet-based videoconferencing and course or learning management systems."
- Responsibilities: teaching face-to-face lectures, grading students' assignments including individual and group works and providing instructor's feedback on their grades, grading and facilitating online discussions, interacting and communicating with students, discussing and deciding how to teach the course with main instructor regularly, and holding the help sessions for students

Purdue University West Lafayette, IN
Teaching Assistant January 2012-May 2012

- EDCI270 - Introduction to Educational Technology and Computing
- *Course description:*

  "This course addresses the fundamentals of educational technology including the integration of instructional design, media, computers and related technologies

within the classroom setting. Students will explore and evaluate how, when, and why technology should be infused into education."

- Responsibilities: teaching face-to-face lab sessions, holding office hours, grading midterm and final exams, checking and grading the students' attendance, grading students' assignments including individual and group works and providing instructor's feedback on their grades, grading and facilitating online discussions, interacting and communicating with students, attending weekly TA meetings and lectures

University of California, San Diego San Diego, CA
Instructor September 2007-December 2008

- LTKO3 - Advanced Korean
- *Course description:*

  "Third Year Korean 3 (5 units) is the first part of the advanced Korean. Students in this course are assumed to have previous knowledge of Korean, which was taught in the Korean 2A, 2B, and 2C courses. Students in this course will learn low-advanced level skills in the areas of listening, speaking, reading, and writing in Korean, as well as expand their cultural understanding. Upon completion of this course, students are expected to acquire and use more vocabularies, expressions and sentence structures and to have a good command of Korean in formal situations."

University of California, San Diego San Diego, CA
Voluntary Teaching Assistant September 2007-December 2007

- IRCO400 – Policy Making Processes
- *Course description:*

  "This course is designed to teach students how to "read" a country's political and economic system. The course will examine how the evolution of different institutional frameworks in the countries of the Pacific region influences the way in which political choices are made."
- Responsibilities: holding help sessions for the international students to help them easy to follow the course, consulting students assignments before submitting, preparing and reviewing the lecture, and summarizing main concepts before midterm and final exam

Kyung-Hee University Seoul, Korea
Co-Instructor March 2001-June 2002

- Course title: Making Films and Editing
- *Course description:*
  "This course is designed original curriculum and instructed three13-weeksmaking films and editing courses to 90 upper division students as part of core program in Department of Journalism."
- Responsibilities: teaching how to plan, shoot, and edit a film, grading students' final products, checking and grading the students' attendance, providing weekly quizzes regarding the film editing procedures and grading them

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Professional Experience

Purdue Extended Campus & College of Education West Lafayette, IN
Online Course Development Consultant August 2012-current

- EDCI326 – Literacy in the Intermediate Classroom (August, 2014-current)
- EDST513 – Educational Facilities Planning (September, 2013-May, 2014)
- EDST694 – Internship in Educational Administration Building Administrator (September, 2013-May, 2014)
- EDST602 – The School Principalship (July, 2013-August, 2013)
- EDST613 – Learning Environments (July, 2013-August, 2013)
- EDPS540 – Gifted, Creative, and Talented Children (January, 2013-June, 2013)
- EDPS545 – Social and Affective Development of Gifted Students (January, 2013-June, 2013)
- EDCI670 – Learning Design and Technology Portfolio (January, 2013-May, 2013)
- Kuwait TSCG course (June, 2012-Februry, 2013)
- STAT301 – Elementary Statistical Methods (January, 2012-June, 2012)
- EDPS591 – Introduction to Statistical Reasoning in Educational Research (January, 2012-May, 2012)
- EDCI577 – Strategic Assessment and Evaluation (August, 2012-December, 2012)
- COM114 – Fundamentals of Speech Communication (August, 2012-December, 2012)
- COM318 – Principles of Persuasion (August, 2012-December, 2012)

- EDPS430 – Creating and Managing Learning Environments (August, 2012-December, 2012)
- EDPS542 – Curriculum and Program Development for Gifted and Talented Learners (August, 2012-December, 2012)
- EDCI577 – Strategic Assessment and Evaluation (June, 2012-August, 2012)
- EDPS531 – Introduction to Measurement and Evaluation (August, 2012-December, 2012)
- Professional GERI Modules (1-9) (August, 2012-December, 2012)

The Korea Daily (Newspaper) San Diego, CA
Staff writer September 2008-June 2010

- Writing news article on daily newspaper and monthly magazine
- Updating local news article on newspaper company websites, www.koreadaily.com
- **Exclusive interview with Donald C. Winter, the 74th Secretary of the Navy** on December 12, 2009
- Training and managing intern journalists
- Received 2008 Best Journalist Award of the Korea Daily in USA

The National Assembly of the Republic of Korea Seoul, Korea
Secretary in Inspection of the Administration Affairs June 2007-September 2007

- Working on the inspection of 62 institutions under the Ministry of Commerce, Industry and Energy
- Checking their annual operations, project results including annual budget and accounts, finding mistakes and suggesting corrections
- Assessment an audit of budgets and accounts of all 39 ministries in Korea

ZAC Communication Ltd. Seoul, Korea
Chief Executive Officer December 2000-December2004

- **Set up numerous Cyber Universities including: Chu-Gae Art College, Kyung Hee Cyber University, A-Ju Cyber MBA and Dong Seo Cyber University**
- Created online content for political communications, education and public relations
- **Created real-time editing system for making online content**
- Consulted for companies to set up on-line employee education system

- **Selected as a recipient of Korean governmental funds for the superior companies ($100,000)**
- Instructed how to create online contents for incumbents in the Ministry of Commerce
- Broadcasted *live on-line content* for cyber universities and companies

Army of the Republic of Korea Seoul, Korea
Sergeant in Transportation Corps August 1996-October 1998

- Leadership: Squad leader in Transportation Corps

Professional Service

Proposal Reviewer

- Proposal Reviewer, Distance Learning Division for Association for Educational Communications and Technology (AECT) National Convention, Jacksonville, FL (November, 2014)
- Proposal Reviewer, Design and Development Division for Association for Educational Communications and Technology (AECT) National Convention, Jacksonville, FL (November, 2014)
- Student Proposal Reviewer, Educational Technology Research and Development (ETR&D) Journal (October, 2013-November, 2013)
- Proposal Reviewer, Design and Development Division for Association for Educational Communications and Technology (AECT) National Convention, Anaheim, CA (October, 2013)
- Proposal Reviewer, Distance Learning Division for Association for Educational Communications and Technology (AECT) National Convention, Anaheim, CA (October, 2013)
- Student Proposal Reviewer, Educational Technology Research and Development (ETR&D) Journal (November, 2012-December, 2012)
- Proposal Reviewer, Design and Development Division for Association for Educational Communications and Technology (AECT) National Convention, Louisville, KY (November, 2012)
- Proposal Reviewer, Design and Development Division for Association for Educational Communications and Technology (AECT) National Convention, Jacksonville, FL (November, 2011)

Technical Assistant

- Technical Volunteer, Association for Educational Communications and Technology (AECT) National Convention, Anaheim, CA (November, 2013)
- Technical Volunteer, Association for Educational Communications and Technology (AECT) National Convention, Louisville, KY (November, 2012)
- Technical Volunteer, Association for Educational Communications and Technology (AECT) National Convention, Jacksonville, FL (November, 2011)

Professional Affiliations

Association for Educational Communications and Technology (AECT, Fall 2010-Present)

- Divisions: Change, Design and Development, Distance Learning, International Media and Technology, Research and Theory, Teacher Education, and Training and Performance

American Educational Research Association (AERA, Fall 2010-Present)

- Division C: Learning and Instruction
- SIG: Instructional Technology

The Korean Society for Educational Technology (KSET, Fall 2010-Present)

- Division: Educational Technology, Human Resource Development

The Korea Contents Association (KOCON, Fall 2013-Present)

- Division: Educational Content, Information Education, Interactive Content, Educational Theories, Content Editing Technology

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Leadership and Community Service

- President of PKA (Purdue Korean Association) 2012-2013
- President of PAET (Purdue Association of Educational Technology) 2011-2012
- President of Korea-focused student association at IR/PS 2007-2008
- Coordinated the North and South Korean Film Festival 2007-2008

- President of the Internet Broadcasting Center at Kyung-Hee University 2000-2001
- President of the Horse-riding Club at Kyung-Hee University 1999-2000

Additional

Computer Skills: Premiere 6.5, After effect 5.0, Final Cut Pro, Photoshop 7.0, Avid Express, Namo 5.0, Dreamweaver 8.0, Flash 9.0, Illustrator 10.0, STATA9.0, MS Office, Blackboard Learn, Moodle, Piazza, Desire2Learn, SCORM, Adobe Presenter 7.0, Adobe Connect, Adobe Camtasia, VoiceThread, SNAPP, NetMiner, UCINET, Prezi, LISREL 9.1, AMOS 22, and SPSS 22

Languages: Fluent in English and Korean, and Intermediate in Japanese